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Quality of Fermented Dadap (*Erythrina variegata* Linn.) Leaves with *Pleurotus ostreatus* Fungus as An Alternative Feed of Monogastric Livestock

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Abstract— *Dadap leaves (Erythrina variegata Linn) are often used as feed supplements for goats, sheep and rabbits, but their use for non-ruminant livestock (such as pigs) is constrained by high levels of fiber so that the high protein content in them cannot be utilized optimally. This research was conducted to optimize the use of dadap leaves (for pigs) with solid substrate fermentation techniques using the Pleurotus ostreatus fungus. Factorial Completely Randomized Design (CRD) (2 factors) was used in this study: factor A (inoculum level) and factor B (incubation time). The inoculum level consists of 5 levels, namely 0%, 3%, 6%, 9% and 12%; while the 3 incubation times were 7 days, 14 days, 21 days and each treatment was repeated 3 times. The variables observed were crude protein, crude fat, crude fiber and gross energy. Data analysis used analysis of variance (ANOVA) and continued with Duncan's multiple distance test (DMRT) if there were significant differences. The results showed that the inoculum level had a very significant effect (P <0.01) on crude protein, crude fat, crude fiber and gross energy. Incubation time had a very significant effect (P <0.01) on increasing crude protein and decreasing crude fiber but had no significant effect (P> 0.05) on crude fat and gross energy. The interaction between inoculum level and incubation time had a very significant effect (P <0.01) on crude protein, crude fat, crude fiber and gross energy. The ideal combination of dadap leaf fermentation (Erythrina variegata Linn.) With Pleurotus ostreatus to improve the nutritional quality of dadap leaves so that it can be used as an alternative feed ingredient in monogastric livestock is an inoculum level of 9% and an incubation time of 7 days.*

Keywords— *Fermentation, dadap leaves (Erythrina variegata Linn.), Pleurotus ostreatus,inoculum level, incubation time.*

I. INTRODUCTION

Feeding was included as larger factors contributing the monogastric pig farm management. Furthermore, costs of feed ingredients used in animal ration were relatively increasing and causing limitation of the farmers to continue their farm development. Therefore, the alternative ingredient sources of animal ration should be urgent in contributing base of animal nutritional ration. One of the alternative ingredient sources of animal ration was the use of dadap leaves (*Erythrina variegata* Linn.). One tree of dadap leaves (*Erythrina variegata* Linn.), defoliated 3 to 4 times in a year produced dried leaves of 15 to 50 kg (NFTA, 1994 and ICRAF, 1997). Kumari and Kumari (2017) reported that dadap leaves (*Erythrina variegata* Linn.) could be used as feed supplement of monogastric animals due to protein content, affecting positive feed consumption and animal performance. Cargil and Mahalaya (2008) stated that protein content in dadap leaves (*Erythrina variegata* Linn.) was around 23-26%, but crude fiber content was also relatively high, affecting decrease of digestive capability and productivity in monogastric animals. Dadap leaves (*Erythrina variegata* Linn.) contained NDF of 50.80%, ADF of 33.30%, hemicelluloses of 17.50%, cellulose of 23.40% and lignin of 9.41%. One strategy of optimalization nutrient content in dadap leaves (*Erythrina variegata* Linn.) was technological fermentation of the solid substrate.

Solid subtrate fermentation could be applied by utilizing microorganism including the *Pleurotus ostreatus* fungus to increase their nutrient content used as an alternative ingredient of animal ration. Fungus group of Basidiomycetes such as Plurotus ostreatus was one microorganism with high capacity to degrade wood including all components of cell wall in wood plant (Gowthamana et al., 2001). Thiskind of fungus was able to produce lignolitic enzyme to decay lignin cell structure (delignification). Delignification occurred by decaying lignin content in dadap leaves (*Erythrina variegata* Linn.). Compound structure of the cellulose-lignin was degraded by ligninase such as lignin perokside (LiP), mangan peroksidase (MnP) and lakase. *Pleurotus ostreatus* fungus was able to secrete lignocellulolitic enzyme such as mangan peroksidase (MnP) and lakase (polifenol oksidase) in lignin degradation. The hidrolitic enzyme of xilanase and cellulase was also involving in degradation of hemicellulose and cellulose (Rodrigues da Luz et al., 2012). Biofermentation of *Pleurotus ostreatus* fungus was able to decrease the tight compound of cellulose content in crude fiber of dadap leaves (*Erythrina variegata* Linn.) in form of meal, affecting increase of its content nutrient content. The fermentation was degrading process of the long structure organic compound into simple organic compound involving microorganism aims to produce feed ingredient with higher content of nutrient, texture and biological availability but lower of anti nutirent compared with the original product without fermentation (Pujaningsih, 2005). Feed stuffs processed by biofermentation contained higher nutrient content compared with the original feed stuffs due to catabolic character of microorganisms with high capability in degrading a complexed structure component into simple structure component of stuffs easily digested by monogastric animals (Winarno et al., 1992).

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The more the component of degraded fiber, the more perfect the hydrolysis of fermentation process to convert the original stuff of higher cellulose into optimum fermented stuffs with lower cellulose (Sun and Cheng, 2002). The *Pleurotus ostreatus* fungus was used in this study due to low price, simple application, easily availability, and safe of toxicity. By process of biodegradation using *Pleurotus ostreatus* fungus, the component of fiber and other polymers in dadap leaves was degraded into simple component containing higher nutrient and digestibility compared with the original leaf products without fermentation. This fermentation dadap leaves could be used as the alternative feed ingredient in monogastric feed ration.

II. Materials and Methods

This study was conducted at Nutrion and Animal Nutrition Laboratory and Animal Production Technology Laboratory, Faculty of Animal Science Sam Ratulangi University, Manado. Analysis of feed fermentation (protein, fat, fiber and gross energy) was conducted at Nutrion and Animal Nutrition Laboratory, Faculty of Animal Science Barwijaya University Malang.

A. Materials

Dadap leaves (*Erythrina variegata* Linn.) were faund at several villages on Tareran district, South Minahasa regency. The *Pleurotus ostreatus* fungus was found from the laboratory of Microbiology and Fermentation of ITB, Bandung, completed the tools used such as scale and other tools for propagation, heat tolerant plastics, plastic tray, autoclave and isolative room for fermentation product.

B. Procedures

Before initiation fermentation process, the initial treatments of fermentation were conducted including defoliating leaves, drying process, grinding leaves and combination of these processes. Sun and Cheng (2002) stated that these initial treatments aimed to reduce the crystallization of cellulose, hemicellulose, lignin and to increase porosity of materials and to open the material structure of lignocelluloses easily accessed by the cellulolytic enzyme (Gowthamana et al., 2001). This method was done to optimize digestibility of the fermented materials. In this study, dadap leaves dried under sunlight during three days, then these dried leaves was grinded into form of meal product, as the the inoculum. The inoculants of 100 g consisted of wood meal 75 g, corn meal 10 g, rice bran 8.5 g, lime 1.5 g and dadap leaf meal 5 g, was filled into heat resistant plastic bag of 1 kg, then it was put into autoclave to be sterilized in the temperature of 120°C during 20 minutes. Then the inoculants were gradually stabilized into room temperature. After stabilizing inoculants into room temperature, those were added by 10 mL of the *Pleurotus ostreatus* fungus spore suspension, then the blended substrate were incubated at the temperature of 28°C during 10 to 14 days. Then materials were dried under sunlight during 3 days. The dried materials were ground into meal form as the inoculums readily used to be feed ingredients in animal ration.

The fermentation process was conducted following the treatments, using substrate dadap leave of 200 g filled into heat tolerant plastic with size of 1.5 kg then inoculated based on treatment. The fermentation products were harvested on time base of inoculation, then dried and grinded to be analyzed. The proximate analysis was done to the variables of crude protein, crude fat, and crude fiber applying method of AOAC (2005) and gross energy applying the method of Bomb Calorimeter.

C. Experimental Design

This study was conducted by involving the completely randomized design in the factorial pattern (2 factors) with treatments of 5x3. Each treatment was repeated 3 times. The first factor was involving levels of inoculum (Li), Li0 = 0%, Li1= 3%, Li2= 6%, Li3= 9% and Li4 = 12%. The second factor was time of incubation (Wi), Wi1 = 7 days, Wi2 = 14 days and Wi3 = 21 days. Data were tabulated and analyzed by analysis of variance base of the factorial pattern (Steel and Torie, 1991). In case of the significant difference of this analysis, it was continued by testing with the method of DMRT (Duncan's Multiple Range Test).

The linear model of analysis of variance base of the factorial pattern:

$Yijk = \mu + \alpha i + \beta j + (\alpha\beta ij) + \varepsilon ijk$

i = inoculum level …, a
j = incubation time …, b
k = replication (1,2,3) …, n

Notes:
Yijk= the observation factor A at the i-th level, factor B at the j-th level and at the k-th replication.
μ = the observation average
αi = the effect of inoculums doses at the i-th level
βj = the effect of incubation time at the j-th level
$(\alpha\beta ij)$ = The interaction effect between inoculums doses at the i-th level and incubation time at the j-th level.
εijk = The effect of error of the inoculum's doses at the i-th level, random error-I, inoculums dose, the incubation time at the j level, and the interaction effect between inoculums doses at the i-th level and incubation time at the j-th level.

III. Results and Discussion

A. *Effect of inoculums level (Li) of fermented dadap leaves (Erythrina variegate Linn.) with Pleurotus ostreatus fungus on crude protein, crude fat, crude fiber and gross energy.*

Based on statistical analysis (Table 1) showed that inoculum level affect significantly ($P < 0.01$) the content of nutrient in dadap leaves. The crude protein and gross energy increased on all levels of inoculums compared with those without inoculum, while the crude fat and crude fiber decreased following the increase of inoculums levels.

Test by DMRT method (Table 1) showed the increase of crude protein at the inoculum levels of 3%, 6%, 9% and 12% compared with Li 0%. The highest crude protein was produced by Li 9% with the significant level of $P < 0.05$) compared with those of Li 0%, 3%, 6%, and 12%. The

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inoculum level of 3% did not affect differently with those of Li 6%. Different inoculums level of 0 % and 12 % gave the same effect on crude protein in dadap leaves. Franca (2009) reported that the more the inoculums level of fungus, the faster the degradation of complexity substrate into simple substrate with higher level degraded. However, higher inoculums level was not efficient in the fermentation process. The highest inoculums level caused increasing microorganism population resulting in the inadequate nutrient needs of their activity and growth. The constant crude protein level TDDF between inoculums level of 0% and 12% in this study showed in Table 1, indicated synchronization and supporting study by Franca (2009).

Level of crude fat (Table 1) showed the lowest TDDF at Li 12% (0.87%), but totally fermented dadap leave meal by *Pleurotus ostreatus* fungus decreased crude fat substrate content compared with those without fermentation. Test by DMRT method (table 1) showed that Li 0% was not significantly different with those of Li 3% and 6%, but significantly (P<0.01) higher of crude fat content from inoculums level of 9% and 12%. This study showed that the *Pleurotus ostreatus* fungus was able to degrade fat substrate in their metabolism process. Stanbury et al. (2017) reported that fermentation as result of microorganism generating such as fungus in the certain media, their enzyme activity caused the chemical change including changing of the complexity compounds (organic compound) such as protein, carbohydrate, fat to be the simple compounds easily digested.

In this study, decrease of crude fiber occurred in all inoculum levels compared with those without fermentation (Li 0%). The lowest crude fiber was found at Li 12% (25.14%). Test by DMRT method (Table 1) showed that Li 12% did not affect significantly (P > 0.05) compared with Li 3% (25.47%). On the other hand, the treatments of Li 6%, 9% were significantly different (P < 0.05) with those of 0%. This case indicated that during the fermentation process, degradation on substrate of dadap leave meal by enzyme activity *Pleurotus ostreatus* fungus was able to degrade complex polymers into simple polymers. The *Pleurotus ostreatus* fungus had been able to use substrate their main nutrient. The substrate used as the main nutrient of fungus secred extracellular enzymes being able to decompose the complex compounds into simple compounds (Ganjar, 2006).

Gross energy (GE) increases following increase the inoculums level with the highest GE (Table 1) at Li 9% (4238.26 kcal/kg). Test of DMRT methods showed that Li 9% was significantly higher (P < 0.05) for GE compared with GE of Li 0%, 3%, 6% and 12%. The inoculum level of 0% was not significantly different (P > 0.05) with those of Li 3% and 12%. Furthermore, GE of Li 3% and 6% was not significantly different (P>0.05). The GE content of Li 0%, 3% and 6% had the same effect on GE in substrate. The GE content of Li 3% and Li 12% was not significantly different (P > 0.05). Generally, this study by the inoculum using *Pleurotus ostreatus* fungus at 3% was still low to support growth of fungus, while the Li of 12% was predicted to be over level causing inefficient to produce energy. The optimum reach of GE content in this study at Li of 9% and level over this level reduced significantly (P<0.01) reaching Li of 12%. The occurrence of abunandce GE content was proving that *Pleurotus ostreatus* fungus utilized substrate as their energy source of their growth. The fungus microorganisms need nutrient base as sources of Carbon, Nitrogen, energy and minerals. These base nutrients were used to be energy source and functioned to create the optimal environment of microorganisms. In finding the maximum product, the upgrading substrate used must contain the mentioned base nutrients (Stanbury et al., 2017). The product of dadap leave meal as the substrate media of fungus propagation in this study contained high energy contents.

TABLE 1. Effect of inoculums level (Li) of fermented dadap leaves (*Erythrina variegate* Linn.) with *Pleurotus ostreatus* fungus on crude protein, crude fat, crude fiber and gross energy

	Crude Protein (%)	Crude fat (%)	Crude fiber (%)	Gross energy (kcal/kg)
Li_0	23.57±0.29^a	1.84±0.13^b	38.96±0.37^c	3237.65±46.18^b
Li_1	24.40±1.87^b	1.22±0.51^{ab}	25.47±2.63^a	4025.39±86.82^{ab}
Li_2	24.36±0.82^b	1.33±0.34^{ab}	27.18±1.22^b	3979.04±101.87^a
Li_3	27.22±2.24^c	0.99±0.28^a	28.47±1.27^b	4238.26±46.45^c
Li_4	23.37±0.64^a	0.87±0.42^a	25.14±1.43^a	4116.42±102.80^b

Note: Different superscript in the same column indicated highly significant (P< 0.01).

B. Effect of incubation times of fermented dadap leaves by Pleurotus ostreatus fungus on crude Protein, crude fat, crude fiber, and gross energy.

The incubation times (Wi) of fermented dadap leaves (*Erythrina variegata* Linn.) by *Pleurotus ostreatus* (Table 2) affected significantly (P < 0.01) to increase the crude protein content of substrate. The statistical analysis showed that the incubation times did not affect significantly (P > 0.05) to increase percentage of crude fat and gross energy level of substrate.

TABLE 2. Effect of incubation times of fermented dadap leaves (*Erythrina variegate* Linn.) with *Pleurotus ostreatus* fungus on crude protein, crude fat, crude fiber and gross energy

Incubation times	Crude Protein (%)	Crude fat (%)	Crude fiber (%)	Gross energy (kcal/kg)
7 d	25.74±2.29^c	1.28±0.58^a	27.58±6.15^a	3917.40±387.71^a
14 d	24.68±1.62^b	1.29±0.38^a	29.50±5.25^b	3922.16±343.72^a
21 d	23.34±0.82^a	1.15±0.50^a	30.05±4.66^b	3918.50±385.82^a

Note: Different superscript in the same column indicated highly significant (P< 0.01).

Table 2 indicates that crude protein level of the incubation time of 7days was significantly higher (P < 0.05) compared with those of 14 days and 21 days. Different time between incubation time of 14 days and 21 days produced crude protein level was significantly different (P < 0.05).

Test by DMRT method (Table 2) indicated that incubation time of 7 days produced crude fiber content of substrate lower significantly (P< 0.05) compared with incubation time of 14 days and 21 days. In addition, incubation time of 14 days produced crude fiber content without significant content of that by the incubation time of 21 days. Results of this study was in agreement with those by Fatmawati et al. (2017) reported that ideal variability of the *Pleurotus ostreatus* fungus incubation times were 2 days to 8 days marked by

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mycelium growth on media surface. Moreover, incubation times between 2 to 10 days reached about 75% of variability.

The additional incubation times of 14 and 21 days in this study were intended to obtain the exact result of crude protein increase in TDDF. In this study, the extra additional times were not able to increase crude protein content of TDDF. This indicated that incubation time of 7 days was including the maximum and ideal activity of *Pleurotus ostreatus* fungus on substrate of dadap leaves as reported by Pelczar and Chan (2013) that incubation time of 7 days had reached the stationary phase and the fungus activity had ended as culmination point of increasing crude protein TDDF. Kusumaningati et al. (2013) reported that the longer the incubation times of fermentation in media, the fewer the nutrition due to high competition of microorganisms using nutrient substrate.

Treatments of incubation times produced crude fat content and gross energy of dadap leaves without significant differences (P>0.05) as presented in Table 2. This indicated that the incubation time of 7 days would reach change target crude fat and GE TDDF. This time period could decrease crude fat content efficiently and increase the optimal gross energy level. The fermentation times could define the enzymes produced. The longer the times of fermentation applied, the more the substrate degraded by enzymes and high nutrient availability causing limited amount of substrate affecting death of fungus (Nuraini et al., 2015).

C. Interaction effect between inoculum level and incubation time of fermented dadap leaves by Pleurotus ostreatus fungus on crude Protein, crude fat, crude fiber, and gross energy.

Data of interaction between inoculums level and incubation times of dadap leave fermentation by *Pleurotus ostreatus* fungus on crude protein, crude fat, crude fiber and gross energy were presented in Table 3.

The statistical analysis of those interaction showed high significant diffrences (P < 0.01) on crude protein, crude fat, crude fiber levels and gross energy. These mean that the inoculums level and incubation times could increase crude protein and gross energy but decrease crude fiber and crude fat levels of substrate. This study was in agreement with study by Nuraini et al. (2015) using *Phanerochaete chrysosporium* fungus (Basidiomycetes group) to degrade coffee husk reporting that inoculums level of 7 % and incubation time of 8 days had the interaction increasing crude protein and decreasing crude fiber of substrate.

Table 3 showed that increasing percentage of crude protein on inoculation levels (Li) of 3%, 6%, 9%, 12% in the incubation times (Wi) of 7 days, 14 days were significantly different (P < 0.01) compared with Li of 0% on the same incubation. The highest crude protein content occurred at the combination treatments of Li of 9% and Wi of 7 days (29,71%). The results of DMRT method (Table 3) indicated that Li of 9% and Wi of 7 days were significantly different (P < 0.01) from combination of other treatment.

TABLE 3. Interaction effect between inoculum level and incubation time of fermented dadap leaves by *Pleurotus ostreatus* fungus on crude Protein, crude fat, crude fiber, and gross energy

Inoculum level (%)	Incubation times		
	7 d	14 d	21 d
	Crude protein (%)		
0	23.75±0.18^{e}	23.34±0.19^{cd}	23.63±0.37^{de}
3	26.65±0.19^{i}	24.33±0.04^{fg}	22.28±0.07^{a}
6	24.52±0.14^{fg}	25.21±0.09^{h}	23.35±0.05^{cd}
9	29.71±0.09^{k}	27.41±0.08^{j}	24.56±0.12^{g}
12	24.15±0.03^{f}	23.09±0.24^{bc}	22.88±0.41^{b}
	Crude fat (%)		
0	1.79±0.20^{d}	1.81±0.14^{d}	1.90±0.02^{d}
3	1.56±0.35^{cd}	1.44±0.14^{cd}	0.65±0.40^{b}
6	1.66±0.20^{cd}	0.95±0.18^{bc}	1.38±0.12^{bcd}
9	1.05±0.16^{bc}	1.04±0.42^{bc}	0.73±0.11^{b}
12	0.34±0.06^{a}	1.19±0.17^{bc}	1.09±0.14^{bc}
	Crude fiber (%)		
0	38.96±0.09^{e}	39.29±0.47^{e}	38.63±0.10^{e}
3	23.30±0.16^{a}	26.18±1.46^{b}	27.99±0.60^{c}
6	25.88±0.53^{b}	27.68±0.80^{c}	27.98±1.09^{c}
9	27.14±0.11^{bc}	28.44±0.97^{cd}	29.83±0.19^{d}
12	23.63±0.17^{a}	25.97±1.63^{b}	25.80±0.62^{b}
	Gross energy (kcal/kg)		
0	3211.82±13.64^{a}	3286.63±53.19^{a}	3214.51±10.71^{a}
3	3918.24±6.65^{b}	4098.68±52.09^{ef}	4059.25±19.88^{de}
6	4002.71±66.45^{bcde}	3944.85±114.69^{bc}	3989.57±145.53^{bcd}
9	4212.91±19.37^{fg}	4203.41±2.99^{fg}	4298.46±4.89^{g}
12	4241.33±33.98^{g}	4077.23±14.95^{de}	4030.71±64.58^{cde}

Note: Different superscript in the same column indicated highly significant (P< 0.01).

Increase of crude protein level in this study indicated that fermentation process of dadap leave as substrate using *Pleurotus ostreatus* fungus were working smoothly. Therefore, fungus could be used on substrate. During fermentation process, substrate generated specific acid smell different with the original material, wet surface of plastic bags of substrate, soft texture, change of color, and additional mass content of cells. These phenomena were indicating the metabolism process of fermentation causing change of substrate (Ganjar et al., 2006). Increasing crude protein in this study showed the *Pleurotus ostreatus* fungus could be utilized by substrate to grow. Solid substrate played role as sources of carbon, nitrogen, mineral and other factors supporting growth and ability to absorb water for microorganisms (Guerra et al., 2003). It can be predicted that level of protein in *Pleurotus ostreatus* fungus also playing contribution of increasing percentage of crude protein of substrate. Sumarmi (2006) reported that *Pleurotus ostreatus* fungus contained high protein ranging from 10.5% to 30.4%. Test of DMRT method (Table 3) showed that the highest percentage of crude protein percentage was combination of treatments between inoculation levl (Li) of 9% and incubation times (Wi) of 7 days.

Table 3 indicated the lowest crude fat level TDDF (0.34%) between inoculation level (Li) of 12% and incubation times (Wi) of 7 days, but totally fermented dadap leaf meal by *Pleurotus ostreatus* fungus on inoculation levels (Li) of 3%, 6%, 9%, 12% and incubation times (Wi) of 7 days, 14 days and 21 days, affected significantly (P < 0.01) compared with those without fermentation of crude fat level TDDF. Crude fat on combination between treatments of inoculation level (Li) of

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9% and incubation time (Wi) of 7 days was not the lowest result, significantly lower ($P > 0.05$) compared with those without fermentation on all incubation times. This study showed that the *Pleurotus ostreatus* fungus was able to degrade fat substrate in its metabolism process. Stanbury et al. (2017) reported that fermentation as result of microorganism propagation such as fungus on specific media, the enzyme activity caused chemical change consists of molecule changes (organic compound) including fat to be simple molecules easily digested.

Table 3 showed decreasing crude fiber content of substrate dadap leaves fermented on all inoculums levels with three incubation times compared with no fermentation meaning that inoculums level and incubation times using fungus of *Pleurotus ostreatus* all reduce crude fiber in dadap leave meal. Test of Duncan (Table 3) showed inoculation level (Li) of 9% and incubation time of 7 days produced lower crude fiber level ($P < 0.01$) compared with incubation times of 14 days and 21 days on inoculation level (Li) of 9%. Crude fiber content on treatment of inoculation level (Li) of 9% and incubation times (Wi) of 7 days (27.14%) were significant different ($P > 0.05$) from treatment without fermentation (Li 0% and Wi 7 days). Decreasing percentage of crude fiber was upto 30.31%. This study indicated that treatment inoculation level (Li) of 9% and incubation times (Wi) of 7 days with fungus of *Pleurotus ostreatus* could be used on substrate as their main nutrient. Substrate used as main nutrient of fungi would secrete extracellular enzymes degrading complex substrate to be simple compound (Ganjar, 2006).

Gross energy increased at all combination for all treatment combination of (LiWi) compared at Li 0% and incubation times of 7, 14 and 21 days. The highest GE level (Table 3) was Li of 9% and Wi of 21 days (4298.46 kcal/kg). Increasing GE indicated that *Pleurotus ostreatus* fungus can be used substrate as energy source for their growth. Microbe of fungus need base nutrient as sources of carbon, nitrogen, energy and mineral. Base nutrient was used source of energy. To obtain the maximum nutrient, the media propagation sould contain base (Stanbury et al., 2017). The material of dadap as substrate in this study contained the relatively high energy (3223.06 kcal/kg).

The inoculum level and incubation times affected significantly ($P < 0.01$) on developed nutrient content in dadap leave (*Erythrina variegata* Linn.) fermented *Pleurotus ostreatus* fungus. The optimal fungus *Pleurotus ostreatus* growth on fermentation. In fermentation process of dadap leave with inoculation level of 9% and incubation times of 7 days increased crude ptotein of 20.06% and gross energy of 24.27%. Decrease of crude fat of 41.34% and crude fiber of 30.31%.

IV. Conclusion

Results of this study concluded fermentation of dadap (*Erythrina variegata* Linn.) leave using *Pleurotus ostreatus* fungus increased nutrient quality in dadap leave. The inoculums level of 9% and incubation times of 7 days produced increased crude protein content (20.06%) and gross energy (24.27%), as well as decreased crude fat content (41.34%) and crude fiber (30.31%). Therefore, dadap leaves fermented could be used as an alternative feedstuff in ration of monogastric animals so it is hoped that the fermented dadap leaves can be used as an alternative feed material for monogastric livestock.

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