Nutritional Value Evaluation of Goroho Banana Skin (*Musa acuminafe, sp)* As Animal Feed by Fermentation With *Rhizopus oligosphorus and Trichoderma viride*

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Abstract
The study aims to determine the effect of fermentation using Rhizopus oligosphorus and Trichoderma viride on Goroho banana skin nutritional quality. The research material is the feed material Goroho banana skin, the inoculum fermentation Rhizopus oligosphorus and Trichoderma virid. A set of tools and materials for fermentation, a set of tools and materials proximate analysis, gross energy analysis and β-carotene analysis. The research method experiment using a completely randomized design (CRD) with 6 treatments 4 replications. The treatment consisted of P0: Goroho banana skin without fermentation, P1: fermented Goroho banana skin Rhizopus oligosphorus 0.3%, 48-hour incubation, P2: fermented of The Goroho banana skin viride 0.3% 120 hours of incubation, P3: Rhizopus oligosphorus fermented Goroho banana skin 0.15% further 48 hours incubation fermentation Trichoderma viride 0.15% 120 hours of incubation, P4: fermented Goroho banana skin Trichoderma viride 0.15% 120 hours of further incubation fermentation Rhizopus oligosphorus 0.15% 48-hour incubation and P5: Rhizopus oligosphorus fermented Goroho banana skin 0.15% + Trichoderma viride 0.15% 120 hours of incubation. The results showed Goroho banana skin-fermented Rhizopus oligosphorus and Trichoderma viride were significantly (P <0.01) in the best increase the content of BK amount of: 2.65% from 89.38 into 91.75% (P5), PK: 66.76%, from 6.47 be 10.79 (P5), LK: 107.62%, from 4.72 into 9.80% (P5), BETN: 3.28%, from 55.75 into 57.58% (P1), GE: 2.96% from 5290 increase to 5447 kcal/kg (P5), improve or degrade SK: 28.22% from 17.29 to 12.41% (P5) and not significant (P> 0.05) reduce the content of beta- carotene at 21.31 % ie from 0.61 to 0.48% at (P3).
Keywords: *Goroho banana skin, fermentation, Rhizopus oligosphorus, Trichoderma viride.*

PRELIMINARY

One alternative feed ingredients for animal feed is a potential banana skin. Banana skin is a waste of processing bananas has not been used optimally. On the territory of the province of North Sulawesi and Gorontalo banana skin waste types Goroho there are always plenty and abundance.

Since the time of our ancestors plant banana Goroho generally grow in the yard and garden belonging to the people of Gorontalo, Goroho banana is a banana with local varieties are not widely known outside the community of North Sulawesi and Gorontalo area compared to other types of bananas which are banana Kepok, Horn and King, Central Statistics Agency data 2018, Gorontalo banana production reached 84.573 quintal or 8.4573 million kg, which was originally prepared in the form of banana chips, fried bananas and boiled bananas from refined process raises new impact is the amount of waste banana skin (± 2,114,325 kg) wasted or untapped.

Fruit of Goroho banana contains nutrients that are quite good, with the content of approximate carbohydrate is 75.18% and 5.16% protein and 0.97% fat content. Have a starch content of 70.78%, which is composed of amylose and amylopectin 39.59% 31.19% (Putra, et al., 2012), results of the proximate analysis Goroho banana skin contains nutrients that consist of 5.41 water, ash 18.68, 7.07 fat, protein of 6.57, crude fiber 10.03 and extract materials without nitrogen (BETN) 52.24% (Weu, 2017).

Banana skin, in general, there is vitamin A which is quite high, especially in the form of provitamin A beta-carotene, as much as 5,127 mg/100 g, the content of beta-carotene was higher than beta-carotene maize of 3.3 mg / 100 g. Carotene β-carotene is a pigment that acts as the yolk can increase egg yolk color score. Banana skin also contains gross energy (GE) of 4383 kcal/kg on raw skins and 4592 kcal/kg on a banana skin ripe (Tartrakon et al., 1999).

Banana skin to be used as poultry feed raw materials have drawbacks presence of coarse fibers are quite high, for example on a banana skin Kepok ie 10.7% (Hartadi et al., 2005), 11.00% on banana Horn and 11.07% in banana Jackfruit (Hernawaty and Aryani, 2007) and the Goroho banana skin contained 10.03% so that when used as poultry feed are given in limited quantities. Improving the quality of banana skin optimally utilized Goroho that needs to be processed by fermentation.

Fermentation is the process of chemical changes that occur on an organic substrate in the presence of enzyme activity produced by microorganisms. The use of microorganisms as enzyme-producing Rhizopus oligosphorus protease and Trichoderma viride produce cellulase enzymes thought to be able to increase the nutrient content of protein and improve skin coarse fiber content of Goroho banana, on the ground that needs to be tested. The study aims to determine how the influence of inoculum fermentation using Rhizopus oligosphorus and Trichoderma viride on Goroho banana skin of nutritional quality.

MATERIALS AND METHODS

Location and Time Research

Banana skin fermentation conducted at the Laboratory Animal Husbandry Gorontalo State University. Analysis of nutrient content: dry matter (DM), crude protein (CP), crude lipid (LK), crude fiber (SK), extract ingredients without nitrogen (BETN), gross energy (GE) and beta-carotene conducted at the Laboratory of Nutrition and Faculty of Animal Feed Hasanuddin University, Makassar.

material Research

This research material is the feed material Goroho banana skin, the inoculum fermentation Rhizopus oligosphorus and Trichoderma viride, A set of tools and materials for fermentation, a set of tools and materials proximate analysis, energy analysis and gross β-carotene analysis .

Research methods

Using the method of completely randomized design (CRD) 6 treatments with 4 replications. Fermentation using *Rhizopus oligosphorus* and *Trichoderma viride*as much as 0.3% of the banana skin BK Goroho. Treatment of fermentation:

1. P0: Goroho banana skin unfermented
2. P1: The Goroho banana skin-fermented Rhizopus oligosphorus 0.3%, 48-hour incubation.
3. P2: The Goroho banana skin-fermented Trichoderma viride 0.3% 120 hours of incubation.
4. P3: The Goroho banana skin-fermented Rhizopus oligosphorus 0.15% 48-hour incubation, further fermentation *Trichoderma viride* 0.15% 120 hour incubation
5. P4: The Goroho banana skin Trichoderma viride 0.15% 120 hours of incubation, further fermentation Rhizopus oligosphorus 0.15% 48-hour incubation.
6. P5: Rhizopus oligosphorus fermented Goroho banana skin 0.15% +*Trichoderma viride* 0.15% 120 hours of incubation.

Research variable

The research variables observed the content of dry matter (DM), crude protein (CP), crude lipid (LK), crude fiber (SK), extra material without nitrogen (BETN), gross energy (GE) and beta-katoten of Goroho banana skin,

Data analysis

Data were tabulated and analyzed using a completely randomized design (CRD) with the help of Microsoft Excel 2010, if there are treatment effects continued honestly significant difference test (HSD). Linear Regression Analysis using SAS aid.

RESULTS AND DISCUSSION

Fermentation using inoculum *Rhizopus oligosphorus* and *Trichoderma viride* gave the changes in the nutritional content of Goroho bananas skins such as in Table 1.

Table. 1. Results of the nutritional content of a Goroho banana skin proximate unfermented and fermented *Rhizopus oligosphorus* and *Trichoderma viride*

Nutrient	Treatment					
	P0	P1	P2	P3	P4	P5
Dry ingredients (%)	89,38cd	89,65cd	88,65d	90,22bc	91,07ab	91,75a
Crude protein(%)	6,47f	7,28e	8,13d	9,05c	9,84b	10,79a
Crude fat (%)	4,72f	5,78e	6,97d	8,09c	8,82b	9,80a
Crude Fiber (%)	17,29a	15,92b	14,71c	14,11c	13,14d	12,41d
BETN (%)	55,75b	57,58a	55,24bc	54,65bc	52,99d	54,41c
Gross Energy (kcal/kg)	5290b	4911d	4956d	5129c	5168c	5447a
Beta carotene(%)	0,61a	0,15a	0,21a	0,48a	0,24a	0,28a

[a, b, c, d, e] Different superscripts in the same row showed a highly significant difference ($P < 0.01$)

The content of dry material (BK)

Table 1 shows the change in the content of BK highest in (P5) is 91.75% and the change in value was lowest for the BK (P2) is 88.65%. Results of analysis of variance showed that among treatment P0 to P5 highly significant ($P < 0.01$) the content of BK and continued with further test honestly significant difference (HSD) showed on Goroho banana skin without fermentation ie: 89.38% (P0) not significantly different ($P > 0.05$) with Goroho banana skins fermentation using Rhizopus oligosphorus incubation of 48 hours is 89.65% (P1), but between treatments (P0) - (P5) other highly significant values ($P < 0.01$) , The influence of the differences caused by different treatment of fermentation and the type of mould that is used.

In fermentation using Rhizopus oligosphorus + Trichoderma viride 120 hour incubation (P5) generates the content of BK at the highest ever at 91.75%, followed by (P4) using a mold Trichoderma viride 120 hours of further incubation mold Rhizopus oligosphorus 48 hours incubation are: 91.07%, subsequent treatment of fermentation further 48 hours incubation Rhizopus oligosphorus, Trichoderma viride 120 hour incubation (P3) that is: 90.22%, then the fermentation treatment Rhizopus oligosphorus 48 hours incubation (P1) is: 89.65%, further treatment Goroho banana skin without fermentation (P0): 89.38% and the lowest in the fermentation treatment using Trichoderma viride 120 hour incubation (P2): 88.65%.

Increased content of banana skin BK Goroho (P5) because a lot of water coming out of a banana skin. Water used Rhizopus oligosphorus or Trichoderma viride to grow and expand causing the water content is reduced. Winarno, (1980) suggested during the fermentation process water contained in the material or substrate portion will be left behind in the material partly going out, with the release of water impacting increase BK. McDonal et al., (1991) stated that during the fermentation process occurs by microbial breakdown of carbohydrates that cause a loss of energy in the form of heat, Carbondioksida and water.

BK levels were low in (P2) than (P0) is due at the time of fermentation, molds (P2) utilize nutrients from the Goroho banana skin as feed. The creased BK (P2) then (P1, P3, P4 and P5) in suspect trichoderma viride The incubation 120 hours more actively take Goroho banana skin nutrients for growth and development than any other treatment. Astuti et al., (2013) stated that fermentation could be a cause of decreased BK ingredients for microbes utilize the nutrients from the substrate to the source of carbon, nitrogen and minerals.

The increase in the average dry matter occurs in (P5) amounted to 2.65% from 89.38 into 91.75%, (P4): 1.89%, from 89.38 into 91.07%; (P3): 0.93%, from 89.38 into 90.22%; (P1): 0.30%, from 89.38 into 89.65%; and a decline in (P1) of 0.81%, from 89.38 to decline 88.65%,

Crude protein content

The percentage of the crude protein content of a Goroho banana skin (P0) - (P5) value varies between 6.47 to 10.79%. Data Table 1 shows the highest crude protein is in (P5): 10.79 and the lowest at (P0): 6.47%. From the analysis of variance showed crude protein Goroho banana skin between all treatments (P0) - (P5) had highly significant (P <0.01). Changes in the percentage of crude protein content in fermentation treatment due to the activity of Rhizopus oligosphorus and fungus Trichoderma viride.

Further Test crude protein HSD Goroho banana skin, between treatments (P0) - (P5) had highly significant (P> 0.01). In (P5) fermentation using Rhizopus oligosphorus + Trichoderma viride 120 hour incubation increase crude protein levels higher at 10.79% compared to (P4): 9.84 (P3): 9.05 (P2): 8.13 and (P1): 7.28% the cause is due to a combination of Rhizopus oligosphorus + Trichoderma viride with an incubation time of 120 hours protease enzyme capable of producing more than (P1, P2, P3 and P4) so that the impact on the increase in the crude protein content. Higher protein (P4 and P3) compared to (P2 and P1) because (P4 and P3) as well as in (P5) the presence of a combination of two types of molds used when fermentation is (Trichoderma viride, Rhizopus oligosphorus further 120 hours,

According to Wang et al., (1979) an increase in protein content during the fermentation process for increasing mold cells. All fungi including Rhizopus oligosphorus and Trichoderma viride as a source of single-cell protein content ranging from 35-40% (Fardiaz, 1987) so that the future growth of the cells can contribute a sizeable increase in protein in the fermented material. Fardiaz, (1992) states oligosphorus producing microorganism Rhizopus proteases with high proteolytic activity. Trichoderma viride fungi species besides producing cellulase enzymes can also produce various kinds of enzymes such as protease, lipase and pectinase (Rogers, 2002).

Time used during fermentation is also associated with the action of the enzyme. incubation 120 hours used by Rhizopus oligosphorus + Trichoderma viride (P5) is a more optimal incubation time for the future growth of the cells compared to the combination of molds (P4) and (P3) which need more time 168 hours. The combination of the use of molds with fermentation methods are varied, such as the fermentation using Rhizopus oligosphorus incubated 48 hours in advance and then proceed fermentation using Trichoderma viride incubation 120 hours (P3) or vice versa (P4) although real contributes to an increase in the value of crude protein of the Goroho banana skin but not as optimal as (P5).

The increase in the average crude protein of numbers (P0) is in (P5): 66.76%, from 10.79% 6.47 becomes; (P4): 52.08%, from 6.47 becomes 9.84%; (P3): 39.87%, from 6.47 to 9.05%; (P2): 25.65%, from 6.47 to 8.13%; (P2): 25.65%, from 6.47 to 8.13% and (P1): 12.51%, from 6.47 becomes 7.28%.

The fat content of Rough

The fat content of a banana skin rough Goroho in Table 1 show among treatments (P0) - (P5) value varies between 4.72 to 9.80%. Crude lipid highest value in (P5), which is 9.80% and the lowest in the (P0), ie 4.72%. Results of analysis of variance showed between treatments (P0) - (P5) was highly significant (P <0.01) in the rough to changes in fat content. HSD shows further test the fat content of a banana skin rough Goroho without fermentation (P0) highly significant (P <0.01) with Goroho banana skin-fermented (P1) - (P5). Likewise among the Goroho banana skin fermentation (P1) - (P5) had highly significant (P <0.01) against rough fat content.

The high crude lipid P5 (*Rhizopus oligosphorus + Trichoderma viride)* with an incubation time of 120 hours) is 9.80% compared to (P4): 8.82, (P3): 8.09, (P2): 6.97 and (P1): 5.78% is suspected mold activity (P5) of the optimal convert carbohydrates into Goroho banana skin fat, which accumulated into hydrolysis fat of the end of the microbial cells. Carbohydrates are the best carbon source for the growth of mold, approximately 15-16% of sugar in the substrate is converted into fat (Nuraida et al., 1996)

More efficient mold changes glucose into fat (Wassef, 1977). Rahman, (1992) suggests the required C / N ratio is high in inducing fat accumulation. Comparative C / N required approximately 80: 1. On the banana skin contains carbohydrates (starches) are quite high at roughly 59% (Anhwang et al., 2009), and the protein content ranged from 4.77 to 6.61% (Tartrakoon et all ., (1999), so that the C / N ratio that is required to induce fat obtained and eventually accumulate fat in the cells of fungi. Increased crude lipid in (P5) of 107.62%, from 4.72 to 9.80% and the lowest (P1) 22.45%, from 4.72 to 5.78%. low levels of crude lipid (P0) than other fermentation treatment caused (P0) obtained pure crude fat source of the fat content of Goroho banana skin.

Increased crude lipid has an average value in (P5): 107.62%, from 4.72 becomes 9.80%; (P4): 86.86%, from 4.72 to 8.82%; (P3): 71.79%, from 4.72 becomes 8.09%; (P2): 47,66,65%, from 4.72 into 6.97% and (P1): 22.45%, from 4.72 to 5.78%.

Crude Fiber Ingredients

The mean value of crude fiber content of banana skin Goroho showed in Table 1, lai varies between 12.41 to 17.29%. The average content of crude fiber obtained from the highest value (P0): 17.29; (P1): 15.92; (P2): 14.71; (P3): 14.11; (P4): 13,14 and (P5): 12.41%.

Results of analysis of variance obtained treatment effect oligosphorus fermentation with Rhizopus and Trichoderma viride gives a highly significant effect (P <0.01) in crude fiber content of banana skin Goroho. Further HSD test showed the value of crude fiber between treatments (P0 to P5) was highly significant (P <0.01). The highest value of crude fiber on (P0) amounted to 17.29% and the lowest in the (P5) is 12.41%.

Fermentation in (P5): 12.41% had low crude fiber (better) were significantly (0 <0.01) compared to (P1) - (P4) for the (P5) mix two molds grow more optimal results in many enzymes are resulting in degrading the cell wall of a banana skin Goroho. On the use of two types of fungus in fermentation where the molds have different growth phase periods. Trichoderma viride vegetative growth phase takes longer, 120 hours compared to Rhizopus oligosphorus, 48. Associated with Trichoderma viride lifetime longer lead to more cellulase enzymes produced by Trichoderma viride cell wall so many banana skin cells hydrolyzed resulting in fiber content rough to decrease.

The next lowest crude fiber on (P4): 13.14% (P <0.01) compared to (P3, P2 and P1). In (P4): 13.14 low crude fiber content compared to (P3): 14.11%, although the same method using two types of mold mixture, but the fermentation by using fungi Trichoderma viride were continued by fermentation of Rhizopus oligosphorus (P4) is less fiber ballpark compared to the method using Rhizopus oligosphorus first and then further mold Trichoderma viride (P3), presumably due to the treatments grow up to become fungi Trichoderma viride were incubated for 120 hours, with respect to decision-nutrients, Trichoderma viride get the nutrients more complete than the ba Goroho banana skin for survival in cells multiply and produce the enzyme, which affected a lot of crude fiber to hydrolysis because of its ability to degrade the cell wall of a banana skin. Rhizopus oligosphorus to continue fermentation only gets the remaining banana skin nutrient degradation results from Trichoderma viride plus most cells were dying. In the method (P3) the use of Rhizopus oligosphorus first utilizes nutrients Goroho banana skin, then continued Trichoderma viride, resulting in crude fiber banana skin Goroho a bit degraded due to less optimal cell populations of fungi Trichoderma viride which grows due to lack of nutrition. Rhizopus oligosphorus to continue fermentation only gets the remaining banana skin nutrient degradation results from Trichoderma viride plus most cells were dying. In the method (P3) the use of Rhizopus oligosphorus first utilizes nutrients Goroho banana skin, then continued Trichoderma viride, resulting in crude fiber Goroho banana skin a bit degraded due to less optimal cell populations of fungi Trichoderma viride which grows due to lack of nutrition. Rhizopus oligosphorus to continue fermentation only gets the remaining banana skin nutrient degradation results from Trichoderma viride plus most cells were dying. In the method (P3) the use of Rhizopus oligosphorus first utilizes nutrients of Goroho banana skin, then continued Trichoderma viride, resulting in crude fiber Goroho a bit degraded due to less optimal cell populations of fungi Trichoderma viride which grows due to lack of nutrition.

The content of crude fiber (P3) was lower (P <0.01) compared to (P2) and (P1) for using two types of fungus in fermentation to degrade than the coarse fibers (P2 and P1) that use only one type of mold. The more high content of crude fiber (P0) than (P1) - (P5) because it is not done then there is no aid fermentation microbes to reduce the content of crude fiber

Crude fiber content of Goroho banana skin decreased after fermentation, respectively decreased on (P5) 28.22% from 17.29 to 12.41%; (P4): 24.00% from 17.29 into 13.14% (P3): 18.39% from 17.29 into 14.11%; (P2): 14.92% from 17.29 into 14.71% and (P1) equal to 7.92% from 17.29 into 15.92%.

Ingredients Extract Without Nitrogen (BETN)

The data in Table 1 shows the value of the content of a banana skin BETN Goroho varies between 52.99 to 57.58%. BETN content value of the highest rates to low '(P1): 57.58, (P0): 55.75, (P2): 55.24, (P3): 54.65, (P5): 54.41 and (P4): 52.99%. Results of analysis of variance followed up HSD test showed that the content of a banana skin BETN Goroho between (P0) with (P1) - (P5) had highly significant (P <0.01). Between (P1) and (P2) - (P5) had highly significant (P <0.01). Between (P2) to (P4 and P5) significantly different (P> 0.01) but with (P3) effect is not significant (P> 0.05). Between treatments (P3, P4 and P5) had highly significant (P <0.01).

The ability of two different types of mold that in utilizing the energy derived from banana skin substrates for growth Goroho different effect on each treatment. The essential thing in the process of fermentation of feed, the content BETN from fermented materials tends to decrease, due to BETN microorganisms widely used as an energy source in its growth. Microorganisms will utilize the digestible energy source that is derived from carbohydrates or BETN. Continuous current activities of microorganisms degrade the substrate, resulting in the energy consumption of BETN more, resulting in lowering the content of the fermented material BETN.

The low content of banana skin BETN Goroho the fermentation treatment (P2, P3, P4 and P5) than without fermentation (P0) for the degradation process of fermentation substrates by Rhizopus oligosphorus and fungi Trichoderma viride resulting in lower levels of BETN. The longer the fermentation time, the declining value of BETN although the treatment fermentation (P1) value is higher, it is alleged in the (P1) treatment using Rhizopus oligosphorus time of incubation to 48 hours, much shorter compared to other treatments so less BETN utilized, other things allegedly Rhizopus oligosphorus utilize nutrients more fat in the substrate as an energy source. Fat in Goroho banana skin by Rhizopus oligosphorus hydrolyzed into fatty acids and glycerol.

Rhizopus oligosphorus and fungi Trichoderma viride used on Goroho banana skin fermentation give increased influence on the content of BETN (P1) of 3.28%, from 55.75 into 57.58%, while giving the effect of successive reduction in (P2) 0.91% from 55.75 down to 55.24%; (P3): 1.97%, from 55.75 into 54.65%; (P5): 2.40%, from 55.75 into 54.41%; and on (P4); 4.95%, from 55.75 into 52.99%.

The content of Gross Energy (GE)

Data Table 1, the content of GE on a Goroho banana skin all treatments varied between 4911-5447 kcal /kg. Rated highest to lowest content of GE respectively (P5): 5447; (P0): 5290; (P4): 5168; (P3): 5129; (P2): 4956 and (P1): 4911 kcal / kg. Results of analysis of variance continued HSD test showed between (P0) with (P1) - (P5) effect very real difference (P <0.01) the content of banana peel GE Goroho. Between treatments (P4) to (P3) and treatment (P2) and (P1) was not significantly different (P> 0.05).

The fermentation process is resulting in changes in the energy content of a banana skin material Goroho. Fermentation using fungi Rhizopus oligosphorus and Trichoderma viride can increase the energy content of the original material as in (P5), reflecting the presence of decomposition of crude fiber to be digested into the digestible alleged activity of cellulase enzymes produced by molds that hydrolyze cellulose to glucose (Sukaryana, 2007).

The decline in banana skin Goroho GE fermentation (P1) - (P4) allegedly caused by the energy Rhizopus oligosphorus and Trichoderma viride in the form of carbohydrates on a remodel substrate material to produce energy in the form of heat, CO_2 and H_2O. Zunael (2009) into Christi et al., (2016) stated that the solid substrate fermentation decreased the amount of dry matter due to organic nutrient used by microbes that produce energy in the form of CO_2 and heat evaporates along particle water.

Goroho banana skin fermentation use Rhizopus oligosphorus and Trichoderma viride gives GE content changes on a banana skin is an increase in (P5) amounted to 2.96% of 5290 increased to 5447 kcal/kg and a decline in (P4) of 2.30% of 5290 decreased 5168; (P3): 5290 decreased 3.04% from 5129; (P2): 6.31% of the 4956 and the 5290 declines (P1) of 5290 decreased 7.16% 4911 kcal / kg.

The content of beta-carotene

beta-carotene content of Goroho banana skin in Table 1 shows the number varies between 0.15 to 0.61% in all treatments. The highest content of beta carotene (P0) is 0.61 and the lowest (P1) of 0.15%. Of all the treatments (P0) - (P1) banana skin Goroho of beta-carotene gives the highest value to lowest, namely (P0): 0.61; (P3): 0.48; (P5): 0.28; (P4): 0.24; (P2): 0.21 and (P1): 0.15%. Based on the analysis of variance followed HSD test showed between treatments (P0) - (P5) was not significantly different (P> 0.05), although on a Goroho banana skin (P1) - (P5) after a fermentation content of beta-carotene average decreased the number of Goroho banana skin without fermentation.

Changes in beta-carotene content of Goroho banana skin fermented decreased during fermentation suspected cases of oxidation due to the presence of oxygen and light. The stability of beta-carotene as well as vitamin A, which is sensitive to light, oxygen and acid media (Anggreani and Yuwono, 2014). The presence of high temperature during the fermentation process may also result in lower levels of beta-carotene (Pratt, 2010 in Candraningtyas, 2018).

Treatment of fermentation (P3) has higher beta-carotene levels in the possibility of treatment method (P3) produce more beta carotene than other treatments (P1) - P5). Supriyono et al., (2014) revealed increased levels of beta-carotene on the substrate material of which is produced by yeasts and fungi that are chromogenic which also produces various kinds of pigments which are green, black, orange and yellow.

Rhizopus oligosphorus and Trichoderma viride in the fermentation of beta-carotene gives change in Goroho banana skin. The decline in beta-carotene occurred at 21.31% in (P3) is from 0.61 to 0.48%; in (P5) of 54.09%, from 0.61 to 0.28%; (P4): 60.65% from 0.61 to 0.24%; (P2): 65.57% from 0.61 to 0.21 % and on (P1) amounted to 75.40% from 0.61 to 0.15%.

CONCLUSION

Based on the results of research that Goroho banana skin fermentation use Rhizopus oligosphorus and Trichoderma viride can:

1. Increase the content of BK, PK, LK, BETN and GE
2. Improve or reduce the content of SK
3. Reduce the content of beta-carotene, but the decrease was not significant (P> 0.05) from the original material.

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