POTENTIAL TABAH BAMBOO SHOOTS FLOUR (GIGANTOCHLOA NIGROCILIATA BUSE-KURZ) IN STIMULATE LACTIC ACID BACTERIA GROWTH

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ABSTRACT

One of the varieties local of bamboo shoots is *tabah* bamboo shoots (Gigantochloa nigrociliata BUSE-KURZ), usually has and having dietary fiber content and nutrients. The potential diatery fiber and oligosaccharide of *tabah* bamboo shoots flour patient stimulate the growth of bacteria lactic acid (LAB) wanted to know in this study. This research consisting analysis total dietary fiber content food in enzymatic, the components of oligosaccharide with High Performance Liquid Chromatography (HPLC), and testing LAB growth in a media flour bamboo shoots patient. The experimental design used was a single-factor randomized block design (RBD). Results showing total dietary fiber on the patient bamboo shoots flour contents 18,29% (db) at the apical, 20,92% (db) at the middle and 14,22% (db) at the basal. The amount of total dietary fiber content obtained showed that *tabah* bamboo shoots flour has potential as a source of dietary fiber. Components of oligosaccharide in the *tabah* bamboo shoots flour presented descriptive. The highest content of 4,55% raffinose (db), and 0,35% sucrose (db). The content of simple carbohydrates in the flour has a *tabah* bamboo shoots can be a prebiotic. The growth of L. acidophilus, L. brevis, L. casei rhamnosus highest at the apical and the middle 2,8 x 10^{10} – 5,8 x 10^{10}CFU/ml. Bifidobacterium bifidum highest at the basal 3,6 x 10^{10}- 3,7 x 10^{10} CFU/ml. This shows that dietary fiber on *tabah* bamboo shoots flour able to stimulate BAL growth.

Keywords:Tabah Bamboo Shoots Flour, Dietary Fiber, LAB.

Introduction

Young of bamboo plants that appear on the surface of the often called the bamboo shoots. Bamboo shoots mostly consumed as a vegetable because having a nice and is good for the health. *Tabah* bamboo shoots (Gigantochloa Nigrociliata) is one of the varieties rebung bamboo in the Pupuan Tabanan regions, having protein content and fibers higher than in Betung bamboo shoots (Dendrocalamus asper) and lower HCN content (Kencana *et al* . , 2012) .

Tabah bamboo shoots it is having a taste that good health as a reward, soft, crispy and sweet . Besides used as culinary or traditional foods , tabah bamboo shoots patient can be processed into a product with simplisia *tabah* bamboo shoots are confident in the form of flour. See many potential of *tabah* bamboo shoots, making simplisia *tabah* bamboo shoots in the form of flour would be very ease in their implementation of other possible. The fibers on *tabah* bamboo shoots fresh every part of which is known 23,66% (db) at the apical , 10,71% (db) in the middle and 27,56% (db) on the basal (Patty, 2014). While the coarse fiber *tabah* bamboo shoots with the treatment blansing 21,48% (db) at on the apical, 16,19% (db) in the middle and 25,82% (db) on the basal (Patty, 2014).

The dietary fiber is a component of food stuffs vegetable important to hydrolysis enzim on human digestive system. Dietary fiber be found a lot in cell walls of plants , and including structural compound as cellulose, hemiselulosa, pectin and lignin (Kudharto, 2006). Manning and gibson in (2004), dietary fiber could be categorized as prebiotik, when a substrate could not absorbed or dihidrolisa inside the intestines smooth, in a selective manner that of the substrate can be fermented by bacteria that benefits as bifidobacterium, that of the substrate fermentation systemic gives the effect of that is favorable to the host.

The term diatery fiber nor the term coarse fiber (crude fiber) commonly used in analysis of food material proximate manner. With their dietary fiber on *tabah* bamboo shoots flour expected to be quite information content on dietary fiber on *tabah* bamboo shoots flour.

Total dietary fiber consisting of Insoluble Dietary Fiber (IDF) and Soluble Dietary Fiber (SDF). Soluble Dietary Fiber have hipoglikemik and hipokolesterolemik characteristics, have prebiotik for mikroflora and serves as the intestines function, while insoluble dietary fiber that is laksatif reduce the risk the formation of cancer the digestive tract (Muchtadi, 2000).

In addition to the components and food fiber oligosakarida polysaccharides (including fibers) claimed a prebiotik activity, but not all carbohydrates food was prebiotik. Oligosakarida known as prebiotik because can serve as the media to the growth of bacteria that profitable in in the digestive tract. oligosakarida is a carbohydrate simple chain short with the chemical structure unique when compared resembling a fiber food.This compound not digestible by enxim-enzim digestion, so they could not absorbed in the small intestine and can enter the colon, next those compounds will fermented by are bacterium favorable in the colon (colon) (Mucthadi, 2004).

It is very important further research to tabah bamboo shoots flour to know the womb dietary fibers and oligosakarida in *tabah* bamboo shoots flour and how it is able to stimulate the growth of bacteria lactic acid (LAB) that were closely related by testing *tabah* bamboo shoots flour can as prebiotic.

Research Method

The materials used in this research include *tabah* bamboo shoots procured from the Women's Farmers Group in Padangan Village, Pupuan District, Tabanan Regency, Bali. The bamboo shoots used had to meet some criteria: the color prior to peeling is bright yellow, with a length of 15-20 cm, and upon peeling the edible portion is bright white in color. afterwards cut into three parts (apical, middle and at the basal). The culture of lactic acid bacteria (LAB) that is used is *Lactobacillus acidophilus*, *L. casei subsp. Rhamnosus, L. brevis, bifidobacterium bifidum* and obtained from PAU Gadjah Mada University

The materials to conduct the analysis include H_2O, H_2SO_4 (Merck), aquadest, pp indicator, anti buih, NaOH 45% (Merck), HCl (Merck), NaOH (Merck), buffer natrium fosfat, enzim *thermamyl A9972* (Sigma), *pepsin* 2844-01 (JT Baker), *pankreatin* EC 232-468-9 (Merck), aseton (Merck), ethanol 95% and 78% (Merck), Na_2SO_3 (Merck), etil asetat (Merck), 2-propanol (JT Baker), $NaCO_3$ (Merck), rochelle salt, Na-bikarbonat, $NaSO_4$ (Merck), $CuSO_4$ (Merck), Arsenomolibdat, raffinose, sucrose, fructose, and galactose standard.

Material for refreshment isolates , calculation bacteria colonies and in the preparation of suspense bacteria covering MRS Broth dan MRSA, MRSB modification (MRSB-m), glucose (MerckTM), anaerobic gas generating kit (Oxoid), gliserol (Pronadisa), NaCl (Merck), l 70% alkohol (Brataco chemika).

The equipment in this research include : oven dryer, furnace, the cup porcelain, a desiccator , tweezers , paper strain , soxhlet , squash measures, erlenmeyer, autoclave, incubator (*Memmert*), microskop (*olympus*), *laminar air flow (ESCO)*, *refrigerator*, petri dish (iwaki-pyrex) , test tube (iwaki-pyrex) , erlenmeyer (iwaki-pyrex) , a measuring glass a (iwaki-pyrex) , a beker glass(iwaki-pyrex), a needle ose , magnetic stirrer , stirrer bar (iwaki bs-38) , of the object glass , the cover glass , a tube eppendorf 1,5 ml, pipetman (gilson) size of 100 ul l and 1000 ul l , tips blue , yellow (*porex bio product*) , the vortex (labinco) , chamber anaerobic (oxoid) , ph meters (TOA ion meter IM 40S) .

Research Procedures

Tabah Bamboo Shoot Flour making

Washed and peeled bamboo shoot, continued with the division of rebung (into three parts apical, middle and at the basal,) sliced thin 0,1 cm, steamed bamboo shoots 5-10 minutes, dried with temperature oven 50°C on for 12 hours. A wedge bamboo shoots dry ground, sifted 60 mesh so obtained flour bamboo shoots.

Dietary Fiber Analysis

a. Sample preparation

The determination of dietary fiber is performed by the use a method of multienzim which was developed by the asp,. Et al., (1983). One gram of in the entire household sample is added 25 ml of a buffer phosphate of sodium 0,1 N with the pH 6 and made into a suspension in erlenmeyer. A suspension in the entire household sample is added 0,1 ml termanyl, and diinkubasi at a temperature of 100 °C throughout 15 minutes of an enthralling first. After a suspension of the cold is added 20 ml akuades with the pH 1,5 and is added 100 mg pepsin, then incubated at a temperature of 40 ºC and agitated for 60 minutes. After a suspension in the entire household sample was reached 60 ºC is added 20 ml distilled water with a pH of 6.8, were then added 100 mg of pancreatin, and then incubated at a temperature of 40 ºC and agitated for 60 minutes, the pH was adjusted to 4.5. A suspension of get filtered from the sample, then washed twice each with 10 ml of distilled water so obtained residues and filtrate.

b. Insoluble fiber dietary fibre determination

The residue that obtained from the preparatory sample washed two times with 10 ml ethanol 95 % and two times with 10 ml acetone. A mixture of solution residue dried at a temperature 105 ºC to severe constant ± 12 hours and is weighed (D1 = heavy constant after analysis and dried). Paper strain and residue of the diabukan at a temperature 500 ºC for five hours after (I1 = weight after to ashes).

c. Soluble Dietary Fibre determination

Filtrat which were found the the preparatory stage of a small sample of ditepatkan the volume has until 100 ml akuades. larutan cast a panorama of the a cup mixed with the last cup as the sole chance 400 ml ethanol 95 % warm (60 ºC) and is deposited for one hour.The sediment is then strained so as with paper strainer also a similar device that is known to it is weighing in at (B2 = heavy paper) strainer also a similar device , then washed two times a day with 10 ml ethanol 78 % and 10 ml acetone .The sediment is then dried at a temperature of 105 ºC until it is weighing in at constant (around 12 hours) (D2 = heavily as after analyzed and it was dried) .Paper strainer also a similar device and its residues diabukan in a kiln the temperature of 500 ºC during 5 hours , then are weighed (E2 = the moisture content of) .

d. Blanko determination

Applications for insoluble fiber dietary fibre (IDF) and for soluble dietary fibre (SDF) obtained by means of the same in the the preparatory stage of sample but in the formulations of the applications the paddies are not used sample districts and all reagent that is used in the preparation stage in the entire household sample the remaining should be used .Of the stage the manufacture of these chareges in the future applications residues and filtrat. The total weight of the residue after dried used as applications for the determination of insoluble fiber dietary fibre (B1).The total weight of the filtrat after a blow dry used as applications for the determination of soluble dietary fibre (B2) .

e. Total Dietary Fibre determination

Total Dietary Fibre Obtained by means add value insoluble fiber dietary fibre with soluble dietary fibre by calculation:

% *Insoluble dietary dibre* (IDF) % db

$$= \frac{(D2 - I2 - B2)}{W} \times 100\%$$

% *Soluble Dietary Fibre* (SDF) % db

$$= \frac{(D1 - I1 - B1)}{W} \times 100\%$$

% *Total Dietary Fibre*= IDF + SDF

The Analysis of the Carbohydrates Tabah Bamboo Shoots

Analysis of the carbohydrate component authors simple *tabah* bamboo shoots flour with the high performance of liquid chromatography (HPLC) according to AOAC (1998). A column that is used is the type of column metacharb 87C with a detector refractive index (RID), flow rate (FR) 0,6 ml/minute. Phases of the motion that is used is H2O with the temperature a column 85ºC. The volume of injection sample is 25µl. standard of sugar used is rafinosa, sucrose, glucose of galactose and fructose. Any peak shows one kind of components sugar. Time retention (RT) of every other component sugar compared with standard time retention sugar. The retention of time that is almost the same indicates the type of components an estimated same.

Results and Discussion

Dietary Fiber tabah bamboo shoots flour

Total dietary fiber content on *tabah* bamboo shoots do not differ on the apicalof real and a middle at 16,34 % (bk) on the tip of and best % (bk) in the middle .The total food fiber the lowest in rebung design bamboo are confident that processed into flour on the part at the base of the 12,41 % (bk) .

The diaetary fibers is different from kurosawa research, 1969 in salahuddin, 2004, where the fibers in the top less than at the bottom at the apical 0,42 %, the middle part of 0,89 % and the basal 1,25 %.This caused differences in varieties kinds of bamboo and the type of treatment different. (table) 1 .

Table 1
Dietary fiber content flour rebung design bamboo resilient than different parts (Apical, Middle and Basal Part)

Component	Apical Part	Middle Part	Basal Part
· Total Dietary Fiber (% db)	16,34 ± 1,14b	17,56 ± 1,21b	12,41 ± 0,74a
· Soluble Dietary Fibre (% db)	3,78 ± 0,68b	4,57 ± 0,69c	2,58 ± 0,34a
· insoluble Dietary Fibre (% db)	12,55 ± 0,48b	12,99 ± 0,52b	9,83 ± 0,42a

Note : db = dry basis
Figures from behind the (±) show standard deviations. The different letters behind the mean of the same line show markedly dissimilar by the experiment duncan % 5

Total food fiber consists of insoluble fiber food content and soluble fiber food. On the bamboo were mixed into flour on the tip of having 12.55% (bk) insoluble fiber food and 3.78% (db) food soluble fiber. the bamboo were mixed into flour in the middle have 12.99% (db) food fiber insoluble and 4.57% (bk) food soluble fiber and in the bamboo were mixed into flour on the point of having 9.83% (bk) food fiber insoluble and 2.58% (bk) food soluble fiber.

The moisture content of food was laid aside as fibers on the bamboo shoot meal and bread dough that stoic bamboo higher ranging from 16.34% - 17.56% (bk) sections at the end of and central when compared with the moisture content of food was laid aside as fibers on flour suweg as much as 15.10% (bk), arrowroot flour 9.78% (bk) (utami, 2008), the banana flour a modification of the fermentation 15.91% (bk) (son of, 2010). Based on the results of the analysis of bamboo flour endurance so that it is the bamboo sprout owning amount minimize food was laid aside as fiber is much more comfortable rather used as a source of fiber food was laid aside.

Muchtadi (2000 not to mention with the) to the total amount of food was laid aside as fiber consisting of components of the dietary soluble fiber of his sdf and a component involving expansion of the dietary insoluble fiber of his idf , idf is the largest group of all from the fiber food special market operation or as in a food , while sdf only occupy the number of a third of the night .On fresh the bamboo sprout has been known to be consisting of 8 % components fibers soluble and 92 % components no fibers soluble (against they will feel et al . , 2012) .

Fibers food soluble is hipoglikemik and hipokolesterolemik and can serve as prebiotik for mikroflora the intestines , while fibers food insoluble that is laksatif reduce the risk the formation of cancer the digestive tract (muchtadi , 2000) .

Fiber content of *Tabah bamboo* flour

The total content of food fiber in *tabah* bamboo shoots processed into flour was not significantly different at the tip and the middle part, which was 16.34% (bk) at the end and 17.56% (bk) in the middle. The lowest total food fiber was found in stoic bamboo shoots which were processed into flour at the base which was 12.41% (bk).

The content of this food fiber is different from the research of Kurosawa, 1969 in Salahuddin, 2004, where the fiber content at the top is smaller than at the bottom, namely at the top of 0.42%, the middle of 0.89% and the bottom of 1.25%. This can be due to differences in varieties of bamboo species and different types of treatment. (Table 1)

Tabel 1
Fiber Content of Bamboo *Tabah* Shoots from different parts (Tip, Middle, center and buttom parts)

Component	Tip Part	Middlepart	Base Part
· Total of FodFiber (% bk)	16,34 ± 1,14b	17,56 ± 1,21b	12,41 ± 0,74a
· Soluble food Fiber (% bk)	3,78 ± 0,68b	4,57 ± 0,69c	2,58 ± 0,34a
· Isoluble Food Fiber (% bk)	12,55 ± 0,48b	12,99 ± 0,52b	9,83 ± 0,42a

Note : bk = Dry Base
The number behind the sign (±) indicates the standard deviation.
Different letters behind the average value on the same line show significantly different in the Duncan Test of 5%

Total food fiber consists of insoluble food fiber content and soluble food fiber. In *tabah* bamboo shoots which are processed into flour at the end have 12.55% (bk) insoluble food fiber and 3.78% (bk) soluble food fiber. In the *tabah* bamboo shoots processed into flour in the middle it has 12.99% (bk) insoluble food fiber and 4.57% (bk) soluble food fiber and in the *tabah* bamboo shoots processed into flour at the base it has 9.83 % (bk) insoluble food fiber and 2.58% (bk) insoluble food fiber.

The content of food fiber in bamboo *tabah* flour is higher, ranging from 16.34% - 17.56% (bk) at the end and middle when compared to the food fiber content of flour flour at Norwegian 15.10% (bk), arrowroot flour 9, 78% (bk) (Utami, 2008), modified fermented banana flour 15.91% (bk) (Putra, 2010). Based on the results of the analysis of *tabah* bamboo shoot flour has a better content of food fiber when used as a source of food fiber.

Muchtadi (2000) states that the total food fiber consists of the Soluble Dietary Fiber (SDF) component and the Insoluble Dietary Fiber (IDF) component, the IDF is the largest group of food fiber in food, while the SDF occupies only a third. Fresh shoots are known to consist of 8% soluble fiber components and 92% insoluble fiber components (Azmi et al., 2012).

Soluble food fiber is hypoglycemic and hypocholesterolemic and can function as a prebiotic for intestinal microflora, while insoluble food fiber that is laxative reduces the risk of developing gastrointestinal cancer (Muchtadi, 2000).

Analysis of Oligosaccharide Components

The components in simple carbohydrates in Tabah bamboo shoots flour containing a monosaccharide (glucose, fructose and galactose), oligosakarida (sucrose and raffinose). (Table 2).

Table 2
Oligosaccharide Components
(Apical, Midle dan Basal Part)

Component	Tip Part	Middle Part	Base Part
· Sucrose (% db) *	0,35 ± 0,08	0,19 ± 0,00	0,14 ± 0,04
· Raffinose (% db) *	2,98 ± 0,25	1,93 ± 1,41	4,55 ± 0,81

Note : db = dry basis
***=** Simple carbohydrates are not tested for real differences

The difference the womb sucrose and rafinosa in each part rebung possible because of differences in of the nature of physiological and biochemistry between part at shoots and suspended from histological on the (tip , central and the trunk) rebung bamboo. Data from chromotogram can be seen in figure 1 .

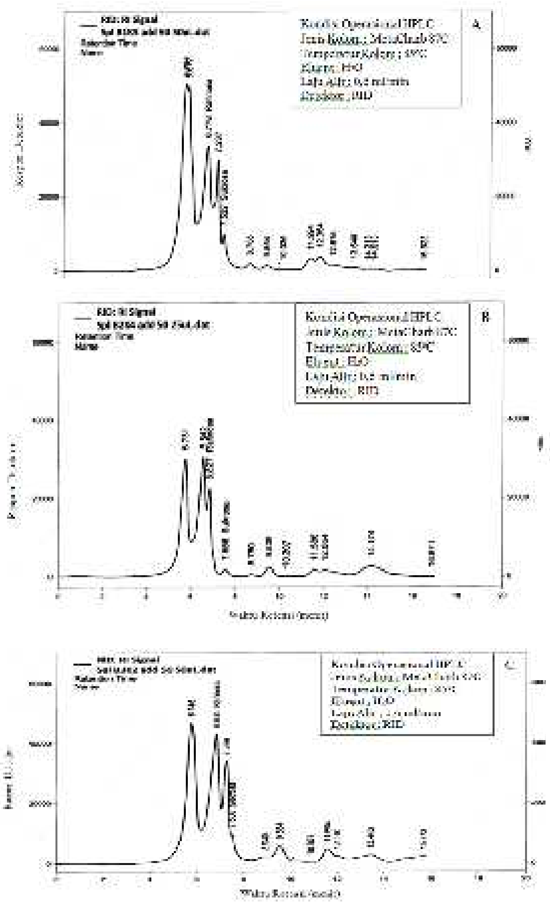

figure 1 Chromatography of Sucrose and Raffinose
(A) Apical part,(B) Middle part dan (C) Basal part

On bamboo endurance so that it is the bamboo sprout that is synthesised into flour on the upper part of obtained the moisture content of sucrose to alamoth probably the treble , because in that part of the country going on chance accident in cell division in which the high and is able to absorb the sucrose cell organelles , so that sucrose will accumulated on the upper part of that you are much greater .The data these are supported of the study thammawong (2009) that the moisture content of sucrose rebung design fresh bamboo a lot be found a lot in bamboo the bamboo sprout fresh portion of an end from local harvests in the top and kind of underneath the surface .The results of the analysis on key aspects of the components in the oligosakarida flour rebung design bamboo endurance so that it is shows that consisting of: sucrose and rafinosa .This seems to indicate that the bamboo sprout meal and bread dough that bamboo endurance so that it is they could be used as as a source of prebiotik in the form of oligosakarida of the family sucrose and rafinosa. In the *tabah* bamboo shoots which are processed into flour at the top, ahigh sucrose content is obtained, because in that part there is a high cell division and cell organelles are able to absorb sucrose, so sucrose will accumulate at the top much larger. This data is also supported by the research of Thammawong (2009) that the sucrose content of fresh bamboo shoots is higher in fresh bamboo shoots at the tip of the crop above and below ground level. The results of the analysis of the oligosaccharide component of *tabah* bamboo shoot flour showed that it consisted of: sucrose and raffinose. This indicates that staple bamboo shoot flour can be used as a source of prebiotics in the form of oligosaccharides from the sucrose and raffinosa families.

Testing the lactic acid bacteria (LAB) in a media modification used Tabah bamboo shoots flour

Lactobacillus acidophilus show good growth in MRSB-m from each of tabah bamboo shoots flour part. Growth in the number of parts MRSB-m the apical namely 2,8 x 10^{10} CFU/g, in the middle part of 2,6 x 10^{10} CFU/g and at the basal of namely 2,5 x 10^{10} CFU/g, while on the media control 1,7 x 10^{6} CFU /g (MRSB without sugar) and 6 x 10^{10} CFU /g (MRSB).

Lactobacillus brevis capable of growing on MRSB-m of tabah bamboo shoots flour each part, in MRSB-m from the middle part is having the highest growth 5,5 x 10^{10} CFU/g. Growth in MRSB-m not markedly dissimilar part on the apical and of the basal namely 2,8 x 10^{10} CFU/g (the apical part) and 2,7 x 10^{10} CFU/g (the basal part). In a media control 1,9 x 10^{6} CFU/g (MRSB without sugar) and 5,5 x 10^{10} CFU/g (MRSB).(Figure 2).

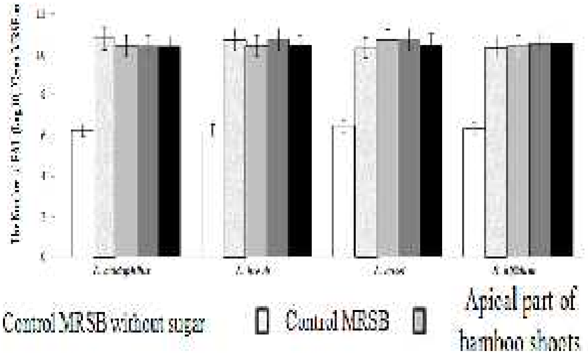

Figure 2 BAL Growth (Log 10)/Gram in MRSB-m Tabah Bamboo Shoots Flour in different parts (Apical, Middle and at Basal)

The growth of *lactobacillus casei* Rhamnosus on MRSB-m not markedly dissimilar on the apical and of the middle part namely 5,4 x 10^{10} CFU/g (the apical part) and 5,8 x 10^{10} CFU/g (the middle part). Growth in MRSB-m the basal part lower of two parts that others are 3,1 x 10^{10} CFU/g. Growth in a media control 2,9 x 10^{6} CFU/g (MRSB without sugar) and 2,3 x 10^{10} CFU/g (MRSB).

Bifidobacterium bifidum show good growth in MRSB-m do not differ in the middle and base part which is 3,6 x 10^{10} CFU/g (the middle part) and 3,7 x 10^{10}CFU/g (the base part). Growth in MRSB-m the apical parts lower than of two others part are 2,6 x 10^{10} CFU/g. Growth in a media control 2,2 x 10^{6} CFU/g (MRSB without sugar) and 2,8 x 10^{10}CFU/g (MRSB).

Based on the data, the growth of the genus *lactobacillus* higher MRSB-m happened at the basal and the middle part, this caused *lactobacillus* more easily use glukosa oligosakarida compared to support growth. Tabah bamboo shoots flour containing glucose, fructose, sucrose and raffinose. Sucrose content higher on the apical and the middle when compared with the content of glucose and fructose little nevertheless still have a role as a source of energy for growth. The existence of the glukosa causing bales can grow well, characterized by increasing the population of bacteria during the incubation 24 hours.

The growth of the genus *bifidobacterium bifidum* higher mrsb-m happened to the middle part of and base of, it is because the media they contain several components glucose and fructose and also containing oligosakarida like sucrose and rafinosa. *B. Bifidum* very able to use oligosakarida to support its growth.

The growth of bacteria lactic acid (BAL) in a media containing tabah bamboo shoots flour caused in the media that contains several components oligosakarida like sucrose and rafinosa. Oligosakarida is a carbohydrate simple short chain with the chemical structure of unique, this compound could not be digested by enzym-enzym digestion, by its very nature resembling a dietary food so that cannot absorbed in the small intestine, which in turn will enter into the large intestine. Will then fermented by good bacteria in the colon, so that oligosakarida referred to as prebiotic. Oligosakarida can serve as prebiotic because he could not digested, but able to stimulation the growth of bacteria lactic acid as *lactobacillus* and *bifidobacteria* in the digestive tract (Weese, 2002).

This is supported from the identification simple carbohydrates in *tabah* bamboo shoots flour identified having some sugar content namely glucose, fructose, sucrose and raffinose. The existence of the total carbohydratesBAL to grow well, characterized at the rising population bacteria during the incubation period is complete 24 hours.

The Growth of Lactic Acid Bacteria on Medium Modification of *Tabah* Bamboo Shoot Powder

Lactic Acid Bacteria used in this test are Lactobacillus acidophilus, L. brevis, L. casei Rhamnosus and Bifidobacterium bifidum. The results of the Lactic Acid Bacteria growth test on media containing oligosaccharides and fibers from bamboo shoot flour and control media (MRSB without sugar). The media used for growth testing is the modified media (MRSB-m) where the commercial media (MRSB) of the glucose component is replaced with Lactic Acid Bacteria bamboo shoot flour, it can be seen that the four BALs used can utilize Lactic Acid Bacteria bamboo shoot flour as a source of sugar for its growth.

Lactobacillus acidophilus showed good growth on MRSB-m from each part of the bamboo shoot flour. The amount of growth in the MRSB-m from the tip is 2.8 x 1010 CFU / g, in the middle 2.6 x 1010 CFU / g and at the base is 2.5 x 1010 CFU / g, while in the control media 1.7 x 106 CFU / g (MRSB without sugar) and 6.0 x 1010 CFU / g (MRSB).

Lactobacillus brevis is able to grow on MRSB-m from each part of bamboo shoot flour, on MRSB-m from the middle section has the highest growth which is 5.5 x 1010 CFU / g. Growth at MRSB-m was not significantly different at the tip and base part, ie 2.8 x 1010 CFU / g (end section) and 2.7 x 1010 CFU / g (base section). On the control media 1.9 x 106 CFU / g (MRSB without sugar) and 5.5 x 1010 CFU / g (MRSB) (Figure 2)

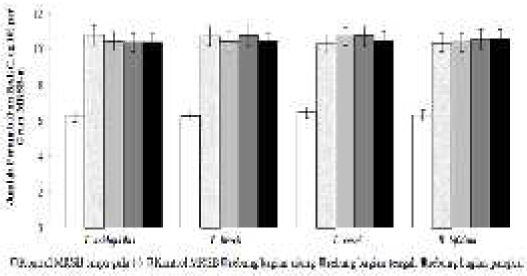

Figure 2 Graph of Number of LAB Growth (Log 10) per Gram on MRSB-m Tabah Bamboo Flour Flour from Different Parts (Edge, Middle and Base)

The growth of Lactobacillus casei Rhamnosus on MRSB-m was not significantly different at the tip and the middle part, namely 5.4 x 1010 CFU / g (the end) and 5.8 x 1010 CFU / g (the middle part). Growth at the base MRSB-m was lower than the other two parts, namely 3.1 x 1010 CFU / g. On the control media 2.9 x 106 CFU / g (MRSB without sugar) and 2.3 x 1010 CFU / g (MRSB).

Bifidobacterium Bifidum showed good growth in MRSB-m not significantly different in the middle and base parts, namely 3.6 x 1010 CFU / g (middle section) and 3.7 x 1010 CFU / g (base section). Growth in the MRSB-m end is lower than the other two parts, 2.6 x 1010 CFU / g. On control media2.2 x 106 CFU / g (MRSB without sugar) and 2.8 x 1010 CFU / g (MRSB).

The growth of colonies from the four BALs on media containing stoic bamboo shoot flour showed good results when compared to the control media (MRSB without sugar). In the study of David (2010), the test media containing oligosaccharide sugar (sucrose, stachhiosa and raffinosa) purification results from the extract of sago palm fruit flour growth of bifidobacterium bifidium colony at 24 hours incubation period was 8.5 log CFU / ml (3.3 x 108 CFU / ml) and growth of Lactobacillus casei Rhamnosus colonies which is 9.2 log CFU / ml (1.5 x 109 CFU / ml).

Based on these data, it appears that the growth of the genus Lactobacillus is higher in the MRSB-m of the tip and middle, this is because Lactobacillus is easier to use simple sugars than oligosaccharides to support its growth. Presumably *tabah* bamboo shoots contain simple sugars such as glucose in addition to oligosaccharides (sucrose and raffinose). The presence of these sugars causes BAL to grow well, which is characterized by an increase in the bacterial population during the 24-hour incubation period.

The growth of the genus Bifidobacterium bifidum is higher in the middle and base MRSB-m, this is because the media contains several components of simple sugars (glucose) and also contains oligosaccharides such as sucrose and raffinosa.B. bifidum is able to use oligosaccharides to support its growth.

The growth of lactic acid bacteria in media containing *tabah* bamboo shoot flour was caused because the media contained several oligosaccharide components such as sucrose and rafinosa. Dwiari 2008, in his research stated that in vitro testing, the presence of simple sugars (glucose, fructose and sucrose) contained in garut sweet patato extract was easily used as an energy source by Lactobacillus casei Rhamnosus compared to oligosaccharides, while in vivo testing, Simple sugars are absorbed by the small intestine and what is available as of lactic acid bacteria substrate is oligosaccharides, with only oligosaccharides available, lactic acid bacteria will use the oligosaccharides as an energy source for growth. Rafinosa is not absorbed by the small intestine and enters the large intestine. In the large intestine the oligosaccharides are metabolized by BAL to colonize (Manning et al., 2004).

Tabah bamboo shoots are known to contain food fiber, sucrose and raffinose. These components can be fermented by test microbes namely Lactobacillus acidophilus, L. brevis, L. casei and Bifidobacterium bifidum. According to Wells et al., (2008) the contents of oligosaccharides, oligosaccharides and sugar are energy and needed in the fermentation process. Krisnayudha research results (2007), identified that the extract of garut sweet patato containing glucose, fructose, sucrose, rafinosa and oligofructose. oligosaccharide extract from arrowroot flour is good as a source of sugar for its growth.

Conclusion

Food fiber content on the flour of *tabah* bamboo mainly on the tip of bamboo and a thinner central at 16,34 % (bk) on the tip of and best % (bk) in the middle. The total food the lowest on the fibers at the base of the 12,41 % (bk). Oligosakarida components in flour of rebung bamboo are confident of sucrose 0.14 % -0,35 % (bk) danrafinosa 1,93-4,55 % (bk). The flour of bamboo stimulate growth balyaitulactobacillus acidophilus, l . Brevis , l. The highest casei rhamnosus on the tip of bifidobacterium bifidum and central and the highest on the the trunk.

The fiber content of stoic bamboo shoots in staple bamboo shoots at the tip and middle section is 16.34% (bk) at the end and 17.56% (bk) at the center. The lowest total food fiber is found at the base which is 12.41% (bk).

Oligosakarida components of flour of *tabah* bamboo shoots containts sukrosa 0,14%-0,35%(bk) danrafinosa 1,93-4,55% (bk). Flour of *tabah bamboo* shoots can stimulte *Lactobacillus acidophilus, L. brevis, L. casei* Rhamnosus higher on the tips compared with the middle and the main parts and *Bifidobacterium bifidum* is high on the buttom of the bamboo. The growth of *L. acidophilus* around 2,5 Cx 10^{10} – 2,8 x 10^{10}CFU/g, *L. brevis* 2,7 x 10^{10} – 5,5 x 10^{10}CFU/g, *L. casei* Rhamnosus 3,1 x 10^{10} – 5,8 x 10^{10}CFU/g and *Bifidobacterium bifidum* 2,6 x 10^{10} – 3,7 x 10^{10} CFU/g

References

Daud, M. 2010. Potensi Oligosakarida Eekstrak Tepung Buah Rumbia (Metroxylon sagu Rottb) Sebagai Prebiotik Dan Simbiotik Dalam Ransum Ayam Pedaging. Disertasi. Tidak dipublikasikan. Program Studi Ilmu Pangan. IPB. Bogor.

Dwiari, S.R. 2008. Pengujian potensi prebiotik ubi garut dan ubi jalar serta hasil olahannya (*Cookies dan sweet potato flakes*) [Tesis]. Ilmu dan Teknologi Pangan. IPB. Bogor.

Fengel, D. dan W. Gerd. 1995. Kayu, Kimia, Ultrastruktur, Reaksi-Reaksi. Gadjah Mada University Press. Yogyakarta.

Kencana, P.K.D. 2009. Fisiologi Dan Teknologi Pascapanen Rebung Bambu Tabah *(Gigantochloa Nigrociliata Kurz) Fresh-Cut. Disertasi. Program Pascasarjana Fakultas Pertanian. Universitas Brawijaya.*

Krisnayudha, K. 2007. Mempelajari Potensi Garut (*Maranta arundiacea* L.) dan Ganyong (*Canna edulis*, Kerr) untuk Mendukung Pertumbuhan Bakteri Asam Laktat. Skripsi. Tidak dipublikasikan. Fakultas Teknologi Pertanian. Institut Pertanian Bogor.

Manning, T.S. and Gibson, G.R. 2004. Prebiotics. Best Practice and Research Clinical Gastroenterology 18(2): 287-298.

Manning, T.S., Rastall R., and Gibson G. 2004. Prebiotics and Lactic Acid Bacteria. *Di dalam* : Salminen S., Wright A. dan Ouwehand A. (editors). 2004. *Lactic Acid Bacteria Microbiological and Functional Aspects*. Ed ke-3, Revised and Expanded. New York: Marcel Dekker, Inc. hlmn 407-418.

Putra, I N. K. 2009. Efektivitas Berbagai Cara Pemasakan Terhadap Penurunan Kandungan Asam Sianida Berbagai Jenis Rebung Bambu. Agrotekno 15 (2): 40-42.

Roberfroid, M.B. 2002. Functional Food Concept and its Application to Prebiotics. Digest Liver Dis. 34 (21):105-108.

Shi, Q.T, and Yang, K,S. 1992. Study on Relationship Between Nutrients In Bamboo Shoots And Human Health. Proceedings of the International Symposium on Industrial Use of Bamboo. International Tropical Timber Organization and Chinese Academy, Beijing, China: Bamboo and its Use; p 338–46.

Thammawong, M., Daisuke. N., Poritosh. B., Nobutaka, N., Takeo. S. 2009. Characteristics of sugar Content in Different Sections an Harvest Manturity of Bamboo Shoot. Hort Science. 44(7): 1941-1946.

Weese, J.S. 2002. Probiotics, Prebiotics, and Synbiotics. Elsevier Sci. 22(8).

Wells, A.L., Saulnier, D.M.A., Gibson, G.R. 2008. Gastrointestnal Microflora and Interactions with Gut Mucosa. Di dalam : Gibson, G.R., Roberfroid, M.B, editor. Handbook of Prebiotics. New York : CRC Press. Hlm 13-38.