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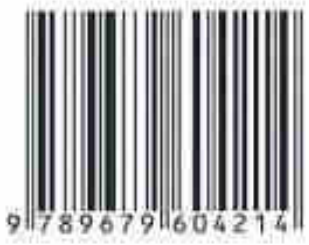

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Functional Food

Foreword by the Vice Chancellor, Universiti Putra Malaysia

Assalamualaikum W.B.T. and greetings.

On behalf of Universiti Putra Malaysia, it gives me great pleasure to welcome all of you to the International Food Research Conference (IFRC 2017).

To mankind, food is the primary source of energy and therefore, life. Since time immemorial, mankind has exemplified ardent interest and creativity towards food creation and consumption which sprang solely from basic instinct and natural curiosity. This curiosity consequently gave birth to what the modernist would now call food research.

In Malaysia at present, the Government has made UPM as the centre of excellence for agricultural education and research to develop skilled manpower for the related industries. The dynamic food sector is thus considered the heartbeat of these industries. Therefore, to be able to face the emerging challenges in the food sector, the Faculty of Food Science and Technology (FSTM) is tasked to spearhead the development of human capital as well as the direction in food research and innovation. Among the approaches taken by FSTM is through the organisation of research conferences such as IFRC 2017. By aiming to disseminate the latest advancement and information in food researches, and also to elevate the industry-university collaboration to new heights, IFRC 2017 will certainly serve as the best platform by which the scientific and academic communities as well as the stakeholders could benefit from.

Congratulations to FSTM for their continuous effort in championing food-related disciplines both locally and internationally as reflected by the organisation of IFRC 2017. The great leap in ranking from 270th (2015) to 229th (2016) as published by the Quacquarelli Symonds's (QS) World University Ranking is indeed the just outcome of the collective efforts taken by all faculties and entities in UPM.

To all IFRC 2017 participants, I would like to urge you to actively participate and engage in the three-day conference by contributing your ideas and insight. I sincerely hope that you will also have an enjoyable stay in Kuala Lumpur and get to experience the warmth of Malaysian hospitality.

'WITH KNOWLEDGE WE SERVE'
Agriculture • Innovation • Life

PROF. DATIN PADUKA DR. AINI IDERIS, ***FASc***
Vice Chancellor
Universiti Putra Malaysia

Foreword by the Dean, Faculty of Food Science and Technology

Assalamualaikum W.B.T and very good day.

On behalf of the Faculty of Food Science and Technology, I am truly delighted to welcome all of you to Universiti Putra Malaysia for the International Food Research Conference (IFRC 2017).

Food research is an important and well-established avenue to spearhead the food science and technology niche area. The food we consume on a daily basis is the result of extensive food research which is a systematic investigation into a variety of foods' properties and compositions. The investigation starts from the food components (macro– and microcomponents of foods, food biochemistry, nutrient changes in foods), to the preparation and technology involved (food processing, food engineering, food packaging, culinary), to the end products (sensory analyses, food safety and quality, functional food, new food development, food service) and ultimately to the dining table for our consumption. As the consumers' knowledge, perception and preference expanded, so too has the food niche which now also includes food marketing, heritage food, halal food and so on. The organisation of the IFRC 2017 is hoped to achieve yet another milestone in bringing food researches to greater heights.

The theme appropriately selected for the IFRC 2017 is "*Emerging Challenges in Food Research"*. To that end, we are very fortunate to have several of the world's leading researchers as our keynote and plenary speakers. I am positive that the IFRC 2017 will offer you a sound basis for academic discussions and the ensuing exchange of ideas. I therefore look forward to facilitating the invaluable dialogue among academics, researchers and market professionals in the spirit that such debate will only pave way to new and exciting approaches and technologies for the food industry.

I would also like to acknowledge the contribution of our co-organisers, supporters, and sponsors. Congratulations are also conveyed to the organising committee without whom the conference would have not been possible.

Lastly, I wish you all a fruitful and wonderful time at the IFRC 2017.

Best wishes,

PROF. DR. NAZAMID SAARI
Dean
Faculty of Food Science and Technology

Foreword by the IFRC 2017 Chairman

Assalamualaikum W.B.T. and good day.

After months of careful planning and preparation, finally the International Food Research Conference (IFRC 2017) is upon us. With nearly 300 participants from around 20 countries, the IFRC 2017 is now on full swing. Having been tailored to cater to wider audience from the food sector, the IFRC 2017, which encompasses the major food areas such as food processing and post-harvest technology, food bioprocessing, food safety and quality, functional food, food service and management, heritage food and halal food, is aimed to provide a platform on which we could face and respond to the emerging challenges in food research.

To our co-organiser, the Institute of Food Science and Technology, College of Agriculture and Food Science, University of the Philippines Los Baños; and our supporters, the Malaysian Institute of Food Technology (MIFT) and the Associated Chinese Chambers of Commerce and Industry of Malaysia (ACCCIM), we extend our sincere gratitude and appreciation for the collaboration that makes the organisation of the IFRC 2017 possible.

Credit also goes to all the invited speakers; Prof. Dr. Da-Wen Sun (University College Dublin, Ireland), Prof. Dr. Hiroshi Inomata (Tohoku University, Japan), and Prof. Dr. Farooq Anwar (University of Sargodha, Pakistan), for graciously sharing their vast knowledge and wisdom. Their years of experience in their respective fields are certainly an asset that will enrich the IFRC 2017.

To fellow academics, researchers, entrepreneurs, industry practitioners, and policy makers who participate in the IFRC 2017, I am entirely certain that you will all benefit from the arranged keynote and plenary speeches as well as the oral and poster presentations.

To the organising committee, you have my endless admiration for your months of effort and energy poured into materialising the IFRC 2017. A job well done!

To our guests from abroad, have a pleasant stay in Malaysia!

Warm regards,
PROF. DR. RUSSLY ABDUL RAHMAN
Chairman
International Food Research Conference 2017

Selection of Lactic Acid Bacteria Can Reduce the Cyanide Compound on The Processing Yam Flour (*Dioscorea Hispida* Dennst.)

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Abstract
The study was carried out to select lactic acid bacteria can reduce effectively the cyanide compounds in the processing yam flour. Lactic acid bacteria used in the study were *Lactobacillus plantarum* FNCC-0027; *Lactobacillus casei* FNCC-90; *Lactobacillus acidophillus* FNCC-0051; *Bifidobacterium bifidum* BRL-130; *Bifidobacterium breve* BRL-131. Data were analyzed using One Way ANOVA and continued with Tukey's test (HSD). *Lactobacillus plantarum* FNCC-0027 as lactic acid bacteria the most effectively reduced cyanide compound in the yam flour was of 41.98% for 24 hours. At 72 hours fermentation can reduce cyanide compound from 411.65 ppm to 23.917 ppm. This level of cyanide is safe. Reducing sugar of yam flour was 0.06%.

Keywords: cyanide, intoxicating yam, *Dioscorea*, *Lactobacillus plantarum*
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Introduction

The yam plant produce the tubers contain edible nutrients that are good enough, but its beneficial is limited. This is because in the yam tubers contain poisonous compounds, namely the Glycoside cyanogenic. Its compound is poisonous in the form of free acid cyanide (HCN). Removal of cyanide poison in yam tubers with traditionally method takes a long time so it is less efficient. These constraints can be overcome by fermentation using mushrooms or bacteria. Research conducted by Sasongko (2009), cyanide decrease from yam tuber 425,44 ppm into yam flour 21,74 ppm through fermentation with 15% concentration of fungus and 72 hours fermentation time. The effectiveness of cyanide reduction was 94.9%. Lactic acid bacteria play a role in the process of cyanide reduction such as *Lactobacillus acidophilus* L10, *Lactobacillus casei* L26 (Donkor and Shah, 2007); *Lactobacillus plantarum pentosus* FNCC 235 (Sumarna, 2010); *Bifidobacterium longum* 536 (Otieno, 2007).
The objective of the study is selective the most effective lactic acid bacteria and fermentation time can reduce cyanide in the processing of yam flour.

Material and Methods

3.1. Sample preparation

The sample used are the yam tubers from Mojokerto District, aquades, MRS broth, and lactic acid bacteria (*Lactobacillus plantarum* FNCC-0027, *Lactobacillus casei* FNCC-90, *Lactobacillus acidophillus* FNCC-0051, *Bifidobacterium bifidum* BRL-130, *Bifidobacterium breve* BRL-131) from Food and Nutrition Center, Gadjah Mada University, Yogyakarta.

Inoculum preparation: taken 100 µl of bacterium from ependoff, inoculated into MRS Broth medium 5 ml, incubated at 37°C for 24 hours. This study was conducted in 2 stages; stage I selection bacteria the most effective in reducing cyanide levels on the yam tubers, stage II determines the most optimal time to reduce cyanide levels at safe limits.

3.2. Selection of bacteria

Bacteria were selection for the most effective in reducing cyanide levels on the yam tubers, were done: yam tubers washed, peeling, size reduction as "sawut", then fermentation for 24 hours at room temperature, laundering for running water, drying with cabinet dryer at 60°C at 17 hours, milling and sifting using an 80 mesh sieve.

3.3. Optimation of Fermentation Time
The "sawut" of yam tubers fermentation with the selected bacteria from the stage I at the time 24, 48 and 72 hours

3.4. Data were analyzed using one-way ANOVA using SPSS version 16 (SPSS Inc., Chicago, Illinois, USA).

Results and Discussion

The results showed that total of *Lactobacillus plantarum* FNCC-0027 during the 24-hour fermentation was highest 11,071 log cfu/ml, whereas the lowest *Bifidobacterium bifidum* BRL-130 bacteria was 10.811 log cfu/ml (Figure 1). Each lactic acid bacteria has different capabilities in utilizing nutrients in the medium of yam tubers. Increase the number of bacteria because in the raw material there is a source of nutrients needed by microorganisms for metabolism. Increasing the total number of bacteria, because LAB can be use the medium or hydrolyze sugar into simpler components to lactic acid, organic acids, CO_2, H_2O and energy (Retnaningtyas, *et al*. 2014).

The average of acidity degree (pH) on fermented tubers ranged from 3.95 to 4.1, whereas the degree of acidity (pH) in tubers without fermentation was 5.85 (Figure 2). Decrease of pH is due lactic acid bacteria able to break down starch and sugar in yam tuber into lactic acid during fermentation. *Lactobacillus plantarum* FNCC-0027 has the lowest pH lowering ability due to the highest total colonies (11.07 log cfu/ml) so that the ability to form lactic acid is greater. Lactic acid bacteria oxidize glucose to pyruvate and energy, wherein energy is used to reduce pyruvate to lactic acid (Sumarna, 2007).

Lactic acid bacteria had the ability to reduce cyanide on the yam tuber the ability of each type of bacteria was different (Figure 3). Cyanide content in control tuber (without fermentation) was 411,6465 ppm (db). Decreased cyanide levels are suspected because lactic acid bacteria have the ability to produce β-glucosidase enzymes capable of hydrolyzing cyanogenic glucoside compounds into water-soluble cyanide acid. According to Kobawila, et al. (2005) that lactic acid bacteria produce β-glucosidase enzymes that can eliminate cyanogenic glucosides. *Lactobacillus plantarum* FNCC-0027 is the most effective lactic acid bacteria in reducing cyanide in the yam tuber by fermentation. The effectiveness of cyanide reduction using *Lactobacillus plantarum* FNCC-0027 was 41.98% higher than *Bifidobacterium bifidum* BRL-130 of 24.67%. According to Meryandini, et al. (2011), *Lactobacillus plantarum* may produce β-glucosidase enzymes that can hydrolyze cyanogenic glucosides. The activity of β-glucosidase enzyme by *Lactobacillus plantarum* bacteria was 3.08 nM / mL/min (Kobawila, et al., 2005).

The results from stage 2, showed that the fermentation time had significant effect on the cyanide content on the yam flour. Fermentation 72 hours can reduce cyanide levels from 411.65 ppm (0 hours) to 23.92 ppm (Figure 4). Decreased cyanide during fermentation due *Lactobacillus plantarum* FNCC-0027 produce β-glucosidase enzyme capable to hydrolyzed cyanogenic glucoside into water-soluble cyanide acid. Sasongko (2009), that CN will be hydrolyzed by enzyme at acid condition. Meryandini, et al. (2011), *Lactobacillus plantarum* may produce β-glucosidase enzymes that can hydrolyze cyanogenic glucosides. Alsuhendra and Ridawati (2013) found, cyanogenic glucosides are hydrolyzed by β-glucosidase enzymes into sugars and cyanohydrin acetone and the cyanohydrin acetone is broken down by the hydroxynitrile liase enzyme into acetone and cyanide acid. This is showed that fermentation time had significant effect on the reducing sugar content of the yam flour. At the fermentation time 24 hours reduces the reducing sugar content, then rises again at 48 hours and 72 hours (Figure 5).

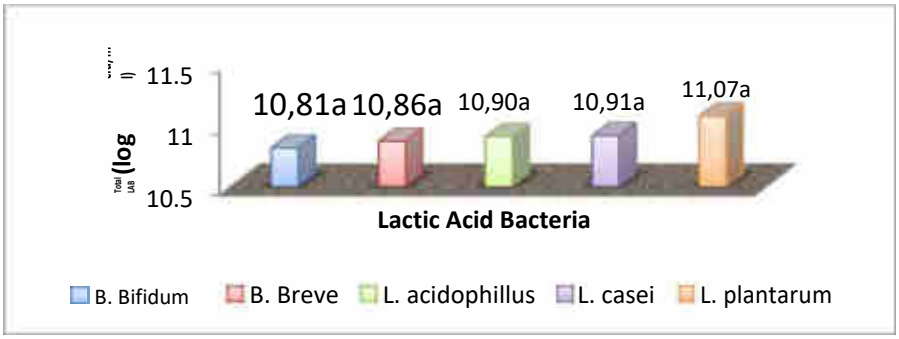

Figure 1: Total lactic acid bacteria in yam tubers after fermentation 24 hours. Values are the mean ± SD (n=3); mean value not significantly different ($p<0.05$) as measured by Duncan test

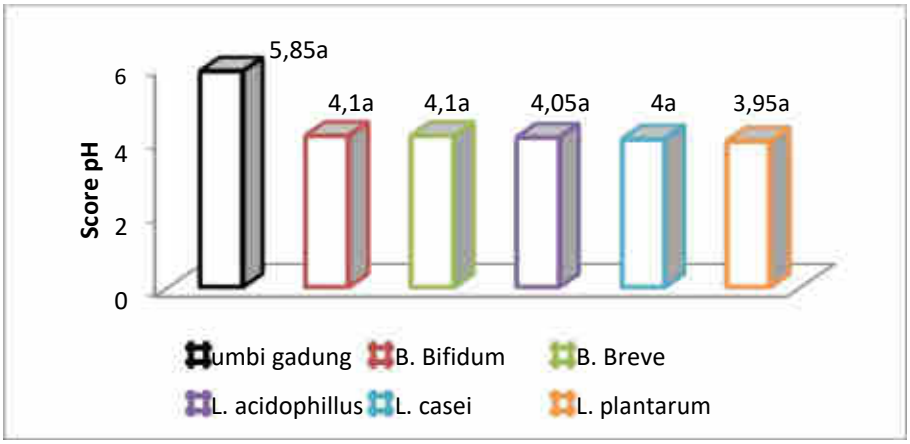

Figure 2: pH score in yam tubers after fermentation 24 hours. Values are the mean ± SD (n=3); mean value not significantly different ($p<0.05$) as measured by Duncan test

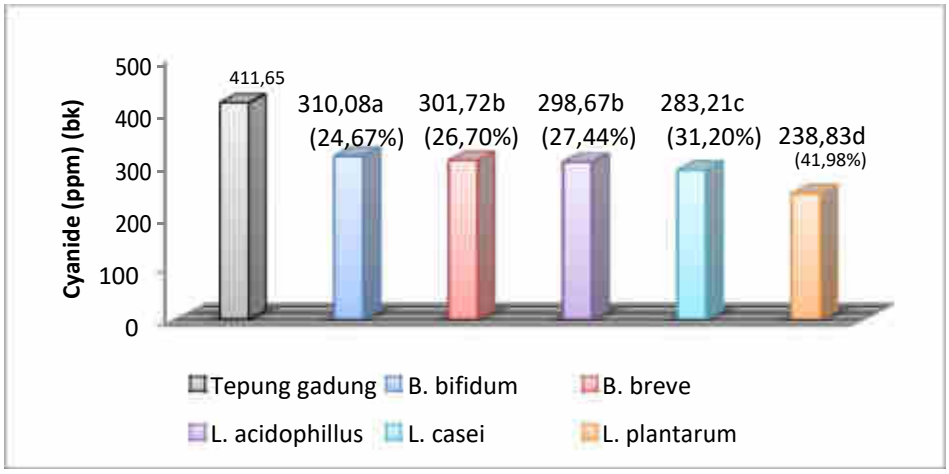

Figure 3: Cyanide content in yam flour after fermentation 24 hours. Values are the mean ± SD (n=3); mean value significantly different ($p<0.05$) as measured by Duncan test

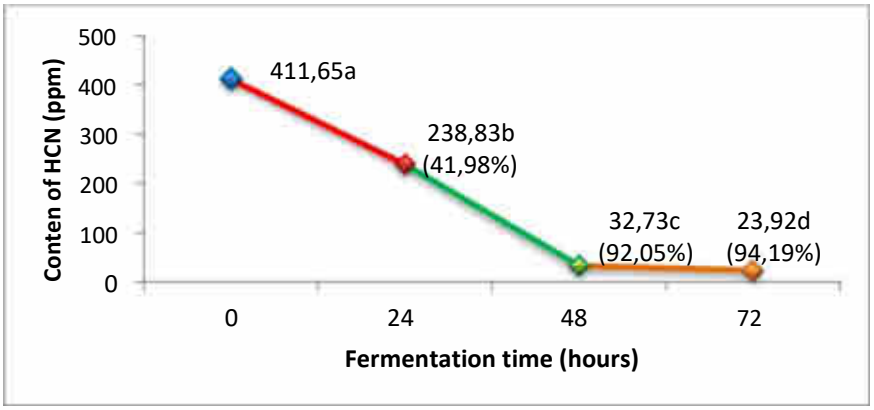

Figure 4: Cyanide in yam flour after fermentation 24, 48 and 72 hours. Values are the mean ± SD (n=3); mean value with different letter as significantly different ($p<0.05$) as measured by Duncan test

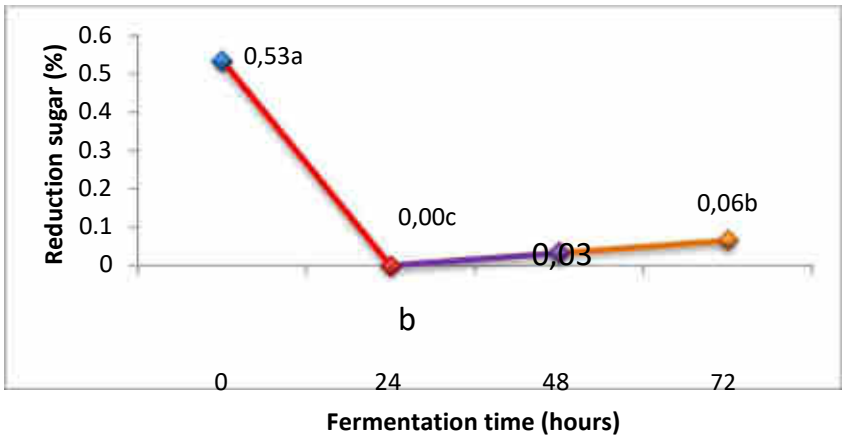

Figure 5: Reduction sugar in yam flour after fermentation 24, 48 and 72 hours. Values are the mean ± SD (n=3); mean value with different letter as significantly different ($p<0.05$) as measured by Duncan test

Conclusion

Lactobacillus plantarum FNCC-0027 is the most effective bacteria can reduce the highest level of cyanide, so as selected lactic acid bacteria. Decrease of cyanide compound in the yam tuber 41.98% during 24 hours of fermentation. The level of cyanide in the yam flour at fermentation time 72 hours was 23.92 ppm (lower than 50 ppm). This content is safe level.

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