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Table of Content

	Page
Foreword by the Vice Chancellor, Universiti Putra Malaysia	xiv
Foreword by the Dean, Faculty of Food Science and Technology	xv
Foreword by the IFRC 2017 Chairman	xvi
IFRC 2017 Proceedings	
Plenary 2	1
Supercritical Fluid Technology for Food Processing <i>Masaki Ota and Hiroshi Inomata</i>	
Food Safety and Quality	
1. IFRC 2017: 035-049 Toxigenic <i>Campylobacter jejuni</i> in Vegetables Farms and Retail Outlets in Terengganu <i>Tang, J.Y.H., Khalid, M.I. and Radu, S.</i>	5
2. IFRC 2017: 037-024 Molecular Typing of <i>Bacillus cereus</i> Isolated from Sago Processing Mills in Sarawak. <i>Jaraee J., Bilung M. L., Nolasco C. H. and Vincent M.</i>	9
3. IFRC 2017: 071-051 Variation of Microbial and Chemical Quality of Two Major Food Fishes in Sri Lanka with Gamma Irradiation. <i>Surendra, I.H.W., Edirisinghe, E.M.R.K.B. and Rathnayake, R.M.N.P.</i>	13
4. IFRC 2017: 138-096 Shiga Toxin <i>Escherichia coli</i> Survival in Different Blending Ratio of Fresh Pineapple-Mango Juice Blends. <i>Kamarul, Zaman, A.A., Shamsudin, R., Mohd Adzahan, N. and Sulaiman, A.</i>	17
5. IFRC 2017: 139-163 Proper Hand Washing Practices in School Canteen: A Qualitative Study on Food Handlers' Belief. <i>Ahmad, I. A., Abidin, U.F.U.Z., Mahyudin, N.A. and Ab-Rashid, N.K.</i>	21
6. IFRC 2017: 141-098 Effect of Poster and Video Intervention on The Knowledge, Attitude and Practice (KAP) Level of Personal Hygiene Among Food Handlers in 24 Hours Mamak Restaurants in Sungai Petani, Kedah. <i>Masyita, M. and Nur Amalina, M.J.</i>	25
7. IFRC 2017: 146-106 Detection of Irradiated <i>Cucurma longa</i> and <i>Cariandrum sativum</i> Using Photo-stimulated Luminescence (PSL) Technique <i>Ros Anita Ahmad Ramli, Ainul Hafiza Abdul Hair and Zainon Othman</i>	29
8. IFRC 2017: 148-107 Trace Level Determination of Organophosphorus Pesticides in Fruit Samples Using Tetramethylguanidine-Silica Nanoparticles as Solid Phase Extraction Sorbent. <i>Veloo, K.V., Adam, F. and Batagarawa, M. S.</i>	33

9.	IFRC 2017: 149-149 Effect of Thickness of Antimicrobial Film-Coated Paper for Food Packaging on Antimicrobial Agent Migration Rate and Biodegradability. <i>Mustapha, F.A., Jai, J., Sharif, Z.I.M., and Yusof, N.M.</i>	37
10.	IFRC 2017: 152-168 Antioxidant Activity and Estragole Content Of Ethanolic and Methanolic Extract of Fennel (<i>Foeniculum Vulgare</i> Mill.) and Nutmeg (<i>Myristica Fragrans</i> Houtt) and its Risk Assessment Using Margin of Exposure (MOE). <i>Martati, E., and Akmalina, M.A.</i>	41
11.	IFRC 2017: 159-116 Selection of Lactic Acid Bacteria Can Reduce the Cyanide Compound on The Processing Yam Flour (<i>Dioscorea Hispida</i> Dennst.) <i>Winarti, S., Murtiningsih and Amalia, S.R.</i>	45
12.	IFRC 2017: 163-148 Antimicrobial and Mechanical Properties of Gelatin Film Plasticized With <i>Nigella Sativa</i> (Black Seed Oil) <i>Han low, Ademola M Hammed, and Munirat A Idris</i>	49
13.	IFRC 2017: 168-124 Application of Hydroxyl Radical Aerosolization on <i>E. coli</i> /Coliform Reduction for Rapid Surface Disinfection in Food Processing <i>Boonchan, W., Chayasitthisophon, A., Foster, K.W., Weeranoppanant, N. and Thipayarat, A.</i>	53
14.	IFRC 2017: 178-143 Residual Heavy Metal and Bio-Accumulated Pesticide Estimation in Commonly Used Fish Food of Pakistan <i>Muhammad Danish, Yad-e-baiza, Maida Fatima, and Muhammad Waseem Mumtaz</i>	57
15.	IFRC 2017: 179-144 The Lipolytic Activity of <i>Pseudomonas fluorescens</i> BIOTECH 1123 in Commercially Available Salted Butter under Refrigerated Conditions and Its Relation to Product Quality Deterioration <i>Babaran, G.M.O., and Mopera, L.E.</i>	61
16.	IFRC 2017: 182-147 Quality Evaluation of Microwave and Conventional Pasteurised Pineapple Juice <i>Abd Aziz, N. A., Mohd Jusoh, Y. M., Nik Mahmood, N. A., Yunus, N. A. and Endut, A.</i>	65
17.	IFRC 2017: 184-152 Development of Selective Esculin Hydrolysis Broth for Rapid Screening of <i>Vibrio parahaemolyticus</i> <i>Sangadkit, W., Deepatana, A. and Thipayarat, A.</i>	69
18.	IFRC 2017: 186-156 Evaluation of the Marketability, Microbial Quality, and Safety of Fresh-Cut Vegetable Mixes from Selected Wet Markets and Supermarkets in Los Baños, Laguna <i>Sotiangco, I.D.G., Piamonte, S.B.H. and Castillo-Israel, K.A.T.</i>	73
19.	IFRC 2017: 187-153 Combined Ozonation and UV-C Treatment to Inactivate <i>E. coli</i> Contaminants in Model Fish Sauce. <i>Sangadkit, W., Kunpanya, P., Deepatana, A., Foster, K.W. and Thipayarat, A.</i>	77
20.	IFRC 2017: 195-174 Case Study of Profiling of Adulterant in Tongkat Ali Herbal Product using Real Time Coupled with High Resolution Melting Analysis <i>N.F. Fadzil, A.Wagiran, F. Mohd Salleh and S. Abdullah</i>	81

21. IFRC 2107: 214-200	85
Microflora Identification of Enteral Feeding Tubes in Neonatal Intensive Care Unit Setting <i>Mahirah Mohamad, Shareena Ishak, Rohana Jaafar and Norrakiah Abdullah Sani</i>	
22. IFRC 2017: 216-202	89
Effects of Hydrocolloids on Physicochemical and Sensory Qualities of Noodles <i>Chiew, C.S. and Theed, S.T.</i>	
23. IFRC 2017: 223-209	93
Perceptions of Plastic Packaging Usage to Pack Hot Foods: The Perspectives of Food Hawkers In Kuala Selangor, Malaysia. <i>Mat Issa, Z. and Ab Rahim, N.F.</i>	
24. IFRC 2017: 225-213	97
Atmospheric Cold Plasma Treatment Effect on Microbiological Evaluation and Moisture Effect of Mango-Fortified Noodles <i>Zabidi N.Z.A., Zaaba S.K., Abidin N.S.A. and Rukunudin IH</i>	
25. IFRC 2017: 242-225	101
Microbiological Quality of Municipal Tap Water and Filtered Drinking Water in Serdang, Selangor <i>Nor-Khaizura M.A.R., Ahmad, N.A., Ahmad Zainal,A.S. and Mahyudin, N. A.</i>	
26. IFRC 2017: 309-268	105
Antimicrobial Activity of Plant Extracts against Foodborne Pathogens <i>Mat Issa, Z., Othman, N., Mustakim, M. and Jipiu, L. B.</i>	
Food Processing and Post-Harvest Technology	
27. IFRC 2017: 014-112	109
Antifungal Activity of <i>Aloe vera</i> gel Towards the Pathogenic Fungus of Papaya Fruit <i>Mendy, T.K., Misran, A., Mahmud, T.M.M and Ismail, S.I</i>	
28. IFRC 2017: 017-009	113
Effect of Different Drying Methods on the Quality of Pink and Grey Oyster Mushrooms <i>Raseetha, S. and Siti-Nuramira, J.</i>	
29. IFRC 2017: 027-142	117
Supercritical Fluid Extraction of Date Seed Oil <i>Jaih, A.A.M., Rahman, R.A., Razis, A.F.A., Ariffin, A.A., Al-Awaadh, A. and Selamat, J.</i>	
30. IFRC 2017: 036-023	121
Effect of Heat Adaptation and Spray Drying Outlet Temperature on the Survival of <i>Lactobacillus</i> sp. Strain 3C2-10 <i>Kunnathep, J. and Oonsivilai, R.</i>	
31. IFRC 2017: 044-029	125
Influence of Maturity Stage of Rhizomes on the Physicochemical and Sensory Properties of Ginger (<i>Zingiber officinale</i> Roscoe) powder <i>Rabang, J.C.T. and Castillo-Israel, K.A.T.</i>	
32. IFRC 2017: 047-047	129
Development of an Artificially-Carbonated Fruit Wine Blend from Mango (<i>Mangifera indica</i> L.), Pineapple (<i>Ananas comosus</i>) and Passion Fruit (<i>Passiflora edulis</i> Sims) <i>Zubia C.S., Hurtada, W.A. and Dizon, E.I.</i>	

33. IFRC 2017: 051-034	133
Development of Vegan Patties for Young Adults as a Source of Calcium using Tofu and Tempeh <i>Neo, Y.P., Au, J.E. and Tan, K.L.</i>	
34. IFRC 2017: 054-054	137
Production Process Technology and Its Characteristics of Probiotic Instant Chocolate Drink <i>Heny Herawati, Sri Yuliani, Widaningrum, Tatang Hidayat</i>	
35. IFRC 2017: 056-041	141
Effects of Virgin Coconut Oil on Qualities of Low Fat Pork Meatball <i>Oonmetta-aree, J.</i>	
36. IFRC 2017: 057-042	145
Rambutan (<i>Nephelium lappaceum</i> Linn) Fruit Processing: Development of Preserve and Ice Cream <i>Rivadeneira, J., Juanico, C., Damaso, C., Espiritu, R., Jolejole, T.K., Lanorio, M.C., Parani, M.S., San Juan, H.O., Sunico, D.J. and Sumague, M.J.</i>	
37. IFRC 2017: 058-043	149
Storage and Processing Stability of Natural Food Colorant from Philippine Wild Raspberry (<i>Rubus rosifolius</i> Linn.) <i>Palomeno, Jr., A.M. and Lizardo, R.C.M.</i>	
38. IFRC 2017: 058-095	153
Resistant Starch Content and Physico-Chemical Properties of Flour from 'Saba' and 'Latundan' Banana (<i>Musa</i> sp.) Varieties <i>Mendoza, C.A.J.G. and Lizardo, R.C.M.</i>	
39. IFRC 2017: 063-048	157
Effect of Squid Ink Addition on the Physicochemical Properties and Acceptability of Noodle <i>Aishah, B., Maisarah, K. and Fadhilah, J.</i>	
40. IFRC 2017: 066-084	161
Effect of Extraction Temperature, pH, and Time on Pectin Yield of Katmon (<i>Dillenia philippinensis</i> Rolfe) <i>Belan, D.L. and Israel, K.A.C.</i>	
41. IFRC 2017: 080-053	165
Physicochemical Properties of Two Varieties of Rambutan (<i>Nephelium lappaceum</i> L.) Fruit <i>Chai, K.F., Karim, R., Adzahan, N.M., Rukayadi, Y. and Ghazali, H.M.</i>	
42. IFRC 2017: 085-058	169
Comparative Study on the Quality and Storage Stability of Instant Mashed Sweet Potato [<i>Ipomea batatas</i> (L) Lam] Prepared Using Three Different Varieties <i>Castillo-Israel, K.A.T., Perez, P.R.G. and Reginio, F.C., Jr.</i>	
43. IFRC 2017: 085-134	173
Potential of Canned and Pouched Adlai (<i>Coix lacryma-jobi</i> L.)- Duck (<i>Anas platyrhynchos</i> L.) Meat Congee as Emergency Relief Food <i>Tapia, M.S.R.C., Horiondo E.J.T., Maghirang, M.C., Peñaflor, L.M., and Reginio, F.C., Jr.</i>	
44. IFRC 2017: 116-075	177
Optimization of Oil, Whey Protein Concentrate and Carboxymethyl Cellulose Levels on Rheological Properties and Stability of Sky Fruit (<i>Swietenia Macrophylla</i>) Seed Oil-In-Water Emulsion <i>Nor Hayati, I., Chong, P. Y. and Yusof, H.M.</i>	

45. IFRC 2017: 120-078	181
Physical and Nutritional Properties of Malaysian Avocado (<i>Persea americana</i> Mill) Fruit <i>Tan, C.X., Chong, G.H., Hazilawati, H. and Ghazali, H.M.</i>	
46. IFRC 2017: 131-089	185
Determination of the Potential of Kamuning (<i>Murraya paniculata</i>) Flowers for Tea Development <i>Navarro, B.R.R. and Iñigo, H.B.R.</i>	
47. IFRC 2017: 134-092	189
Characteristic of Edible Film from Pectin of Citrus (<i>Citrus Aurantifolia</i>), Papaya (<i>Carica papaya</i> L.) and Latundan Bananas (<i>Musa acuminata</i> × <i>M. balbisiana</i>) Peel Wastes: A Comparative Study <i>Hapsari N., Rosida, D.F., Ramadhani, P.V., Sudaryati., Dewati, R</i>	
48. IFRC 2017: 142-099	193
Effect of Maltodextrin, Tricalcium Phosphate and Glycerol Monostearate on Moisture Sorption Characteristics of Jamun (<i>Syzygium cumini</i> L.) Pulp Powder <i>Dey Paul, I., and Das, M.</i>	
49. IFRC 2017: 156-114	197
Optimization of Pretreatment Conditions and Drying Temperature in White Taro [<i>Colocasia esculenta</i> (L.) Schott] Flour Production <i>Lirio, A.L.C., Reginio, F.C., Jr., Ignacio, M.C.C. and Dantes, P.T.</i>	
50. IFRC 2017: 158-132	201
The Effect of Pectinase, Glucoamylase and Cellulase Enzymes on the Extraction Yield of Roselle Petals. <i>Mardiah., Noli Novidahlia, Ma'rifat Khoirunnisa, and Hanafi</i>	
51. IFRC 2017: 166-150	205
Effect of Emulsifier at Different Concentrations on the Properties and Characteristics of Biodegradable Films Based on Gelatin with Palm Oil for Food Packaging Application <i>Zazalli, S.A., Nabilah, B., de la Caba, K., Guerrero, P. and Nur Hanani, Z.A.</i>	
52. IFRC 2017: 170-126	209
Low Fat Coconut Flour as a Coconut Milk Powder Supplement for Improving Health and Reducing Cost of Product <i>Dharmasena, D. A. N., Herath, H.M.T.K. and Madujith, T.</i>	
53. IFRC 2017: 196-175	213
Optimization of Sweet Cassava (<i>Manihot esculents crantz.</i>) Crude Extract with High Maltodextrin Level Using Response Surface Methodogy. <i>Posridee, K. and Oonsivilai, R.</i>	
54. IFRC 2017: 207-188	217
Effect of Gamma Irradiation and Different Packagings on the Shelf Life of Mushrooms) <i>Agaricus bisporus</i> (<i>Fartash, E., Khoshtaghaza, M. H., Abbasi, S</i>	
55. IFRC 2017: 211-194	221
Effect of Ultrasound Treatment on the Functional Properties of Jackfruit Seed Starch <i>Mohamad Yazid, N.S., Abdullah, N., Muhammad, N.</i>	
56. IFRC 2017: 212-196	225
Influence of Drying Methods on the Bioactive Compound and Antioxidant Activity of Pomelo Residue <i>Abd Rahman, N.F., Shamsudin, R., Ismail, A. Shah, N.N.A.K. and Varith, J.</i>	

57. IFRC 2017: 247-226	229
Development of Fish Gelatin Coatings Incorporated with Lemon Peel Extracts as Antimicrobial Packaging to Extend the Shelf Life of <i>Flammulina velutipes</i> . <i>L. Naphawan, Z.A Maryam Adilah, Z.A. Nur Hanani</i>	
58. IFRC 2017: 248-230	233
Non-Evaporative Method to Remove High Boiling Point Solvent (Ethyl Lactate) from Palm Oil Extract at Atmospheric Conditions <i>Kua, Y.L., Gan, S., Morris, A. and Ng, H.K.</i>	
59. IFRC 2017: 255-241	237
Effect of Aloe Vera Powder as Fat and Corn Flour Replacers in the Production of Reduced Fat Beef Meatballs <i>Nurfazwin, Z., Nur Izzah Arifah, Z.A., Mohamad Afifi, I., Mat Yusoff, M. and Ismail-Fitry, M.R.</i>	
60. IFRC 2017: 259-272	241
Optimization of Natural Red Colorant Production from Roselle Using Ultrasound-Assisted Extraction <i>Mokhtar, N., Pak-Dek, M.S., Hamid, A.A., Mohd-Johar, A.H.H., and Jaafar, A.H.</i>	
61. IFRC 2017: 277-254	245
Rheological Properties, Emulsion and Oxidative Stability of Cocoa Butter Based Salad Dressing During Storage <i>ishak, I., Hussain, N. and Mohd Hariri, N.A.</i>	
62. IFRC 2017: 279-255	249
Effect of Extraction Methods with Different Matrix for Gelatin Recovery and Properties: A Review <i>Ee, S. C. and Jamilah Bakar</i>	
63. IFRC 2017: 310-269	253
Comparison of Sensory Quality and Preference Between Fermented Barleys, Glutinous Rice and the Combination of Barley and Glutinous Rice <i>Ibrahim, N., Ezani, N. A. B., Ahmad Kamal, N., Mazlan, N., Abu Kassim, N. A., Jipiu, L. B., Abdul Aziz, S. A. and Mat Issa, Z</i>	
Functional Food	
64. IFRC 2017: 017-010	257
Bioactive Compounds of Coffee Pulp and Cocoa Pod: Valorisation as Food Ingredient <i>Raseetha, S. and Raudzatul-Adawiyah, M. H.</i>	
65. IFRC 2017: 018-113	261
'Ceri' Terengganu, <i>Lepisanthes fruticosa</i> the Rare Fruits of Malaysia, With New Potential. <i>Sukirah Abdul Rahman, Muhammad Anas Othaman, Nur Yuhasliza Abdul Rashid, Nur Diyana Alyas, Hazniza Adnan, Nor Hazniza Aziz and Musaalbakri Abdul Manan.</i>	
66. IFRC 2017: 029-018	265
Bioactive Compounds and Nutritional Properties of Khao-Mao <i>Singthong, J., Oonsivilai, R., Onmetta-aree, J. and Onsaard, E.</i>	
67. IFRC 2017: 043-030	269
Comparative Analysis of The Nutrient Content and Antioxidant Activity Of Lagikway (<i>Abelmoschus manihot</i> L), Alugbati (<i>Basella alba</i> L), Camote (<i>Ipomoea batatas</i> L), and Saluyot (<i>Corchorus capsularis</i> L) Leaves <i>Algar, A.F.C. and Sediño, D.J.I.</i>	

68.	IFRC 2017: 070-055 Effect of Solvents on Extraction and Bioactive Properties of Commercial Grape Cultivars in Taiwan <i>Sridhar, K. and Charles, A.L.</i>	273
69.	IFRC 2017: 079-086 Quality of Dried Rice Noodles Incorporated with Differently Encapsulated Carrot Powders <i>Ismail, H. Karim, R. and Muhammad, K.</i>	277
70.	IFRC 2017: 081-087 Effect of Sago and Tapioca Starches on The Physicochemical Properties of Expanded Rice Products Coloured with Red Beetroot (<i>Beta vulgaris</i>) Powder <i>Abdul Alam, N.A., Karim, R. and Muhammad, K</i>	281
71.	IFRC 2017: 092-088 Anti-browning and Antioxidant Properties of <i>Clinacanthus nutans</i> (Burm. F.) Lindau on “Granny Smith” Apple Juice. <i>Husain N. F., Rahman R.A., and Suleiman N.</i>	285
72.	IFRC 2017: 098-066 Prebiotic Potential of Oligosaccharides Derived From <i>Kappaphycus alvarezii</i> Using Microwave-Assisted Hydrolysis <i>Chan, S.T., Chye, F.Y. and Siew, C.K.</i>	289
73.	IFRC 2017: 102-067 Antioxidant and Metabolite Identification of Different Varieties of Dates (<i>Phoenix dactylifera</i> L.) <i>Hana Kadum, Azizah Abdul Hamid, Faridah Abasa, Abdul Karim Sabo Mohammed, Nurul Shazini Ramli</i>	293
74.	IFRC 2017: 106-069 Effectivity of Ethanol Extract of Purple Sweet Potato Var. Ayamurasaki as Natural Antihypertension in Doca-Salt Hypertensive Rats <i>Irma Sarita Rahmawati, Soetijpto, Annis Catur Adi, Aulanni'am</i>	297
75.	IFRC 2017: 110-070 Chemical Composition And Physicochemical Properties Of Red Seaweeds (<i>Kappaphycus alvarezii</i> , <i>Euचेuma spinosum</i> and <i>Euचेuma striatum</i>) from Sabah, Malaysia <i>Mohd Subakir, F.N., Wan Ishak, W.M.F., Mohd Azman, N.A., and Ibrahim, A.I.</i>	301
76.	IFRC 2017: 118-077 Quality Attributes of Malaysian Coconut Water (MATAG and MAWA) <i>Halim, H.H., Williams-Dee, E., Pak Dek, M.S., Hamid, A., Ahmad, N. and Jaafar, A.H.</i>	305
77.	IFRC 2017: 119-235 Proximate Composition and Vitamins of <i>Mangifera odorata</i> from Fruit pulp and Peel <i>Nur Diyana Alyas, Muhammad Anas Othaman, Hazniza Adnan, Sukirah Abdul Rahman, and Nur Yuhasliza Abd Rashid and Norhazniza Aziz</i>	309
78.	IFRC 2017: 121-079 Response Surface Optimization on the Total Phenolic Content and Antioxidant Activities of Sabah Snake Grass (<i>Clinacanthus nutans</i>) Leaves Peleg Kinetic Modelling Extract <i>Fazil, F.N.M., Azzimi, N.S.M. and Zubairi, S.I.</i>	313
79.	IFRC 2017: 123-083 Insect Powder: A New Protein Source <i>Valenzuela, K.M. and Duque, S.M.</i>	317

80.	IFRC 2017: 124-166 Extracted Water Soluble Polysaccharide from Gum Arabic as Potential Prebiotic <i>Ahallil Hammad., Aminah Abdullah., Shahrul R. Sarbini and Mohamad Yusof Maskat</i>	321
81.	IFRC 2017: 129-212 Effect of Taste Genetic Determinants on Oral Fatty Taste Sensitivity and Perception among Obese and Non-Obese Subjects <i>Ahmad Riduan Bahauddin, Roselina Karim, Nazamid Shaari and Zalilah Mohd Shariff</i>	325
82.	IFRC 2017: 133-091 Antioxidant Activity of Tea Formulation of Leaves of <i>Leucaena Leucocephala</i> (Lam) de Wit, Soursop (<i>Annona muricata</i> L.) and Bay Leaf (<i>Syzygium polyanthum</i>) With Black Tea <i>Rosida, D.F., Putri, C.A., Murtiningsih</i>	329
83.	IFRC 2017: 135-094 Sabah Snake Grass (SSG) Pearls for Food Application <i>Kong,H. S., Mohd-Kasim, Z. and Abdullah Sani, N.</i>	333
84.	IFRC 2017: 137-122 Development of Convenient Fruit Bars as Sources of Dietary Fiber and Potassium from Thai Fruits <i>Racha Saiprasongsin, Visith Chavasit and Aurawan Kettawan</i>	337
85.	IFRC 2017: 160-117 Profile of Antioxidant in Dark Chocolate Product that Enriched with Herbs <i>Suprayatmi,M., Hutami, R., Tiastadia, I.P., Purnamasari, D</i>	341
86.	IFRC 2017: 162-119 Effect of Thermal Treatment on Total Phenolic Content and Antioxidant Activity of <i>Garcinia atroviridis</i> and Fenugreek Seed <i>Ummi Kalthum Ibrahim, Umirah Rashidah Dalip, Suzihaque, M.U.H., Syafiza Abd Hashib and Siti Fatma Abd Karim</i>	345
87.	IFRC 2017: 176-140 Inhibitory effects of mungbean soup on the enzymes and regulator related to type 2 diabetes <i>Saeting, O. and Sae-tan, S.</i>	349
88.	IFRC 2017: 188-157 Ovarian Histomorphological Changes in Rats Supplemented with Edible Bird's Nest <i>Albishtue, A. A., Yimer, N., Zakaria, M.A.,Haron ,A.W.,Rosnina, Y</i>	353
89.	IFRC 2017: 189-158 Effects of pH and Storage Temperature on the Stability of Encapsulated Anthocyanins from Red Dragon Fruit (<i>Hylocereus polyrhizus</i> (Weber) Britton & Rose) <i>Zaidel, D.N.A., Makhtar, N.A., Mohammad, N.A., Mohd Jusoh, Y.M. and Muhamad, I.I.</i>	355
90.	IFRC 2017: 191-162 Total Phenolics, Flavonoids and Antioxidant Activity of Sudanese Baobab (<i>Adansonia digitata</i>) Fruit Pulp <i>Idris, Y.M. A., Ibraheem, S. A., Mustafa, S. E.and Kabeir, B. M</i>	359
91.	IFRC 2017: 223-210 Comparison of Sensory Quality and Preference between Fermented Barleys, Glutinous Rice and the Combination of Barley and Glutinous Rice <i>Ibrahim, N., Ezani, N. A. B., Ahmad Kamal, N., Mazlan, N., Abu Kassim, N. A., Jipiu, L. B., Abdul Aziz, S. A. and Mat Issa, Z.</i>	363

92.	IFRC 2017: 231-216 Glycemic Index of Chocolate Fortified with Pumpkin (<i>Cucurbita moshata</i>) and Taro (<i>Colocasia esculenta</i>) Powder and its Effect on Mood and Cognitive Functions of Female students <i>Shahidan, N., Salleh, N.Z., Rois Anwar, N.Z., Zakaria, Z.</i>	367
93.	IFRC 2017: 240-220 Chemical Composition of Mesocarp and Exocarp from <i>Borassus flabellifer</i> <i>Rodiah M. H., Jamilah B., Russly A. R., and Sharifah Kharidah S. M.</i>	371
94.	IFRC 2017: 244-224 Physico-chemical Properties of Spray Dried Powders from Two Varieties of Amaranth (<i>Amaranthus viridis</i>) <i>Siti Faridah, M.A., Tan, L.Y. and Muhammad, K.</i>	375
95.	IFRC 2017: 246-228 Investigation of Nutritional and Bio-active Properties of Selected Sri Lankan Marine Macro-algae <i>Warnasooriya, S.G.V.B., Jayawardana, B.C., Liyanage, N.L.B.R. and Nirooparaj, B.</i>	379
96.	IFRC 2017: 253-240 Comparative Evaluation of Total Phenolics, Total Flavonoids and Antioxidant Capacity of Dried Shrimp and Fermented Shrimp Products <i>Kaida, S.T., Rahmat, A. and Ramli, N.S.</i>	383
97.	IFRC 2017: 281-257 Effect of Germination Treatment in Amino Acids and Proteins Content of Jackfruit Seeds <i>I.Zuwariah, H. Hadijah, I.Aida Hamimi and R. Rodhiah</i>	387
98.	IFRC 2017: 284-261 Hypocholesterolemic Effect Of Dietary Fibre Powder From Pink Guava By-Product <i>Ibrahim A. H., Hassan H., Ismail A., Samad A.N., Nordin N.</i>	391
Halal Food		
99.	IFRC 2017: 140-097 Perception of Food Sellers towards Halal Labelled Fish Ball in Kelantan <i>Zul Ariff Abdul Latiff, Mohamad Izwani Halim and Mohamad Amizi Ayob</i>	395
100.	IFRC 2017: 153-110 Halal Malaysia Brand Equity Mishap: False Recognition of Brand Mere Recognition using Implicit Association Test. <i>Wan Rusni Wan Ismail, Mohhidin Othman, Russly Abdul Rahman, Nitty Hirawaty Kamarulzaman and Suhaimi Ab. Rahman</i>	399
101.	IFRC 2017: 210-195 Do SMEs Halal Food Products Measure Up to Customer Expectation? : An Empirical Investigation <i>Abdul Salam, S. S., Othman, M., Ungku Zainal Abidin, U. F. and Kamarulzaman, N. A.</i>	403
102.	IFRC 2017: 224-217 Revisiting the Theory of Planned Behaviour (TPB) In Halal Food Purchasing: After the Case of Cadbury <i>Mohd Helmi Ali, Azman Ismail, Syed Shah Alam and Zafir Mohd Makhbul</i>	407
103.	IFRC 2017: 229-232 Muslim Consumers' Awareness and Perception of Halal Food Fraud <i>Ruslan, A.A.A., Kamarulzaman, N.H and Sanny, M.</i>	411

104. IFRC 2017: 230-227 416
Muslim Consumer's Awareness and Acceptance on Halal Genetically Modified Food Labelling
Md Rapi, N.R., Kamarulzaman, N.H. and Ismail, N.W.
105. IFRC 2017: 258-244 420
Halal Assurance System (HAS) Cost Analysis Using Descriptive Quantitative Methods and Prevention, Appraisal, Failure (PAF) (Case Study at the Chicken Slaughterhouse Mitra Karya Unggas Batu East Java Indonesia)
Sucipto Sucipto, Riska A. Novita, Danang T. Setiyawan, Mas'ud Effendi and Retno Astuti
106. IFRC 2017: 273-252 424
Comparative Study Of Acid And Alkaline Pre-Treatment Process Prior To Gelatin Extraction From Rohu (*Labeo Rohita*) Scales
Khairulnizam, A.B., Jamilah, B., Nur Hanani, Z.A., Russly, A.R. and Kharidah, M.
107. IFRC 2017: 205-192 428
Halal practices integrity and halal supply chain trust in Malaysian halal food supply chain
Kamisah, S., Mokhtar, A., and Hafisah, A.
- Food Bioprocessing**
108. IFRC 2017: 034-031 432
Survival, physicochemical properties and digestive stability of microencapsulated *Lactobacillus* spp. strains 21C2-10 in probiotic ice cream.
Sengsaengthong, S., Oonsivilai, R.
109. IFRC 2017: 045-039 436
Effects of different processing methods on hydroxycitric acid content of "batuan" [*Garcinia binuca* (Blanco) Choisy] fruits
Bainto, L.C., Dizon, E.I., Israel, K.A.C. and Laurena, A.C.
110. IFRC 2017: 125-085 440
Physical properties of heat treated purple potato (*Solanum tuberosum* cv. Shadow-Queen) flour
Santiago, D.M.O., Yamauchi H., Koaze H.
111. IFRC 2017: 104-093 444
Comparative study on the phytochemical and antioxidant properties of fermented jackfruit leaves (*Artocarpus heterophyllus* L.) leaves using single and mixed starter cultures
Norhazniza, A., Koh, S.P., Rosmawati A., Nur Syazwani, A.H., and Razali, M.
112. IFRC 2017:107-167 448
Changes in Phenolic Content and Antioxidant Activity of Rice Bran by *Aspergillus oryzae* as Influenced by Different Initial Moisture Content
Jamaluddin, A., Abd. Rashid, N., Abd. Razak, D.L., Abd. Ghani, A., Mansor, A., Abdul Manan, M., Md. Saad, A.Z., Sani, N. and Jonit, M.J.
113. IFRC 2017: 221-206 452
Selection of *Acetobacter* Species Isolated from Fermented Cocoa Beans in Dong Nai Province for Their Potential Use as Starter Cultures
Vu T.L.A., Nguyen M.H., Phan T.H.
114. IFRC 2017: 114-215 456
Fermentation Characteristic of Kuini (*Mangifera odorata*) and Its Potential as Substrate to Acetic Acid Bacteria
Adnan, H., Othaman, M.A. and Alyas, N.D.

115. IFRC 2017: 271-250	460
Development of GABA Malted Milk Drink from Germinated Brown Rice <i>I. Zuwariah, I. Aida Hamimi, R. Rodhiah, and H. Hassan</i>	
Food Service and Management	
116. IFRC 2017: 157-115	464
Pilot interviews of job satisfaction with offshore catering employee <i>Majid, M. A. A., Othman, M., Mohamad, S. F., and Lim, S. A. H.</i>	
117. IFRC 2017: 222-207	468
Identifying Possible Factors of Job Stress and Employees Intention to Leave a Job: A Case of Casual Typed Restaurant Employees in Johor Bahru. <i>Majid A., N., Ghazali, H. and Farahwahida, A.</i>	
118. IFRC 2017: 222-242	472
Initial Findings of Possible Factors Contribute to Job Stress among Casual Dining Restaurant Employees in Klang Valley, Malaysia. <i>Farahwahida, A. and Ghazali, H.</i>	
119. IFRC 2017: 256-264	475
Internship satisfaction factors and instruments: A review and research directions for the undergraduate hospitality programs <i>Ruslan, S., Mohamad, S.F., and Othman, M.</i>	
120. IFRC 2017: 276-251	479
A qualitative study on factors influencing older consumer dining out behaviour <i>Ganesan, L., Abu Bakar, A.Z., and Othman, M.</i>	
Others	
121. IFRC 2017: 275-253	483
Hemicellulose Extraction and Characterization of Oil Palm Empty Fruit Bunches <i>Nor Nadiha, M.Z., Russly, A.B. and Jamilah, B.</i>	
Sponsors	487
Organizing committee	491

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 acidophilus* 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 acidophilus* 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. Optimization 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, CO₂, H₂O 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).

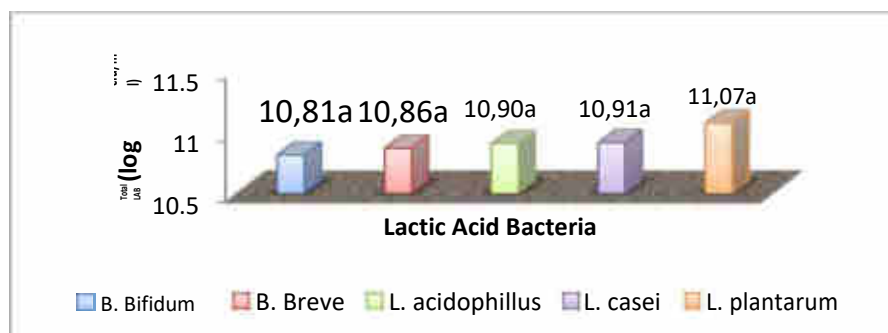


Figure 1: Total lactic acid bacteria in yam tubers after fermentation 24 hours. Values are the mean ± SD (n=3); mean value not significantly different (p<0.05) as measured by Duncan test

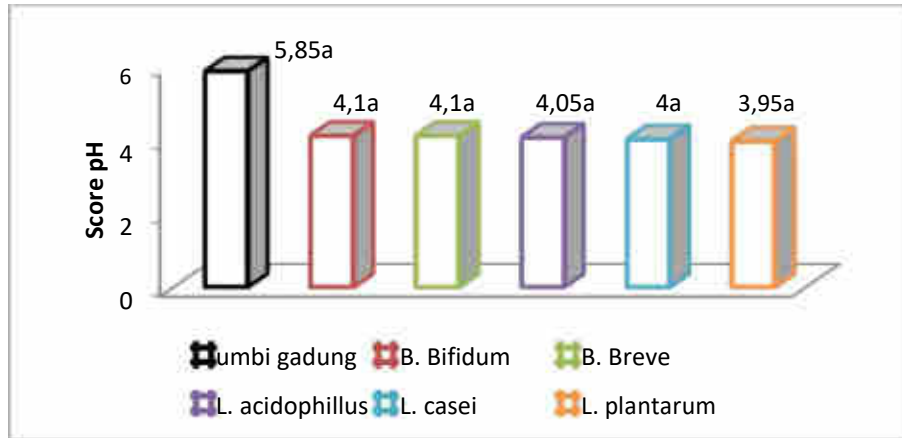


Figure 2: pH score in yam tubers after fermentation 24 hours. Values are the mean \pm SD (n=3); mean value not significantly different ($p < 0.05$) as measured by Duncan test

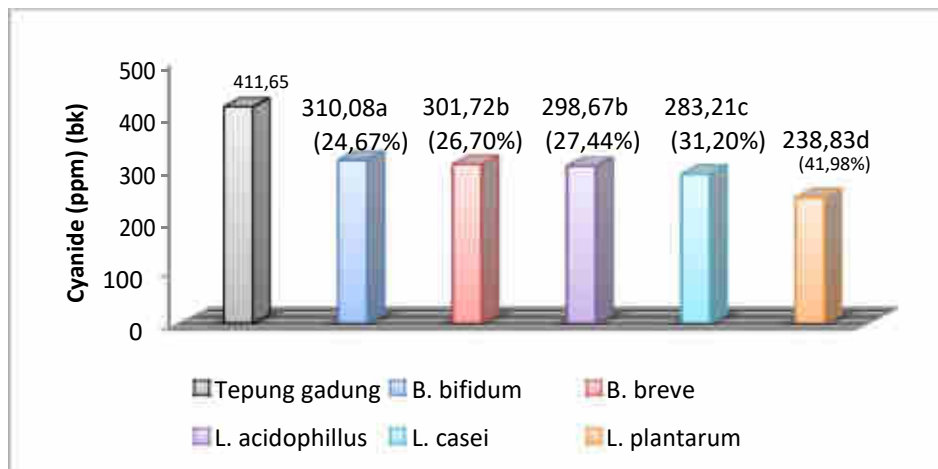


Figure 3: Cyanide content in yam flour after fermentation 24 hours. Values are the mean \pm SD (n=3); mean value significantly different ($p < 0.05$) as measured by Duncan test

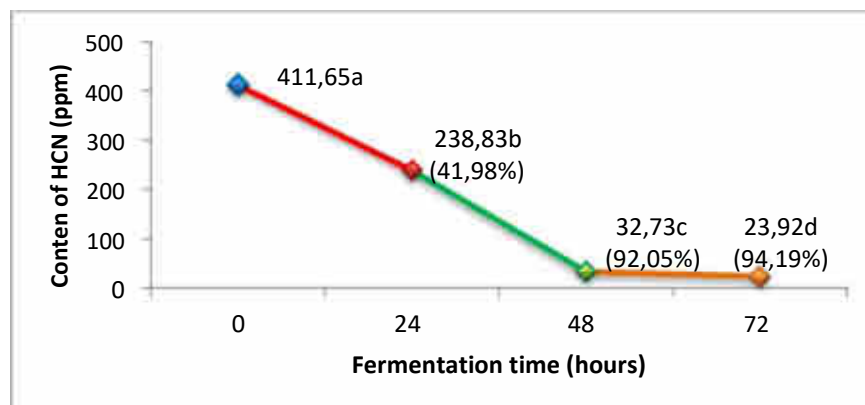


Figure 4: Cyanide in yam flour after fermentation 24, 48 and 72 hours. Values are the mean \pm SD (n=3); mean value with different letter as significantly different ($p < 0.05$) as measured by Duncan test

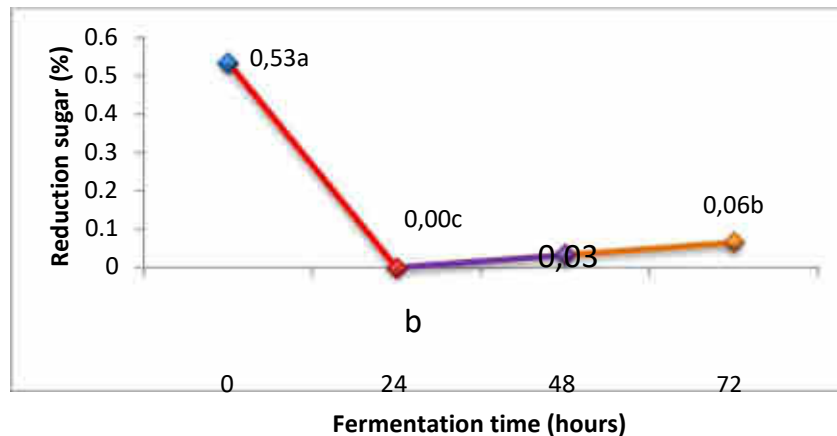


Figure 5: Reduction sugar in yam flour after fermentation 24, 48 and 72 hours. Values are the mean \pm SD (n=3); mean value with different letter as significantly different ($p < 0.05$) as measured by Duncan test

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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