Abstracts of

5th IUFoST-Japan Webinar on Food Functionality

Mar. 10th, 2023



IUFoST-Japan

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Date : 10 March, 2023 (Fri) 15:30~17:45 (JST) Organizer: IUFoST-Japan Chair: Takuya Sugahara, Yutaka Miura Cochair Yasuki Matsumura, Kentaro Matsumiya

Program	
15:30-15:35	Opening remarks (Chair: Takuya Sugahara)
15:35-16:05	Kuan-Chen Cheng (National Taiwan University, Taiwan)
	Fermented Chenopodium formosanum Koidz and its bioactivity
16:05-16:35	Hiroko Tabunoki (Tokyo University of Agriculture and Technology, Japan,)
	Construction of the systems for sustainable food provision using insects in
	Japan
16:35-16:40	Break
16:40-17:10	Sri Wijanarti (Kyoto University, Japan/Gadjah Mada University, Indonesia)
	Bioavailability of Pro-Hyp upon ingestion of collagen hydrolysate (CH)
	with the presence of rice protein hydrolysate (RPH)
17:10-17:40	Agus Budiawan Naro Putra (National Research and Innovation Agency,
	Indonesia)
	A glance at current condition of functional foods in Indonesia: regulation,
	research and development
17:40-17:45	Closing remarks (President of IUFoST-Japan, Mitsutoshi Nakajima)

Fermented Chenopodium formosanum Koidz and its bioactivity

Institute of Food Science and Technology, National Taiwan University, Taiwan Kuan-Chen Cheng, Ph.D.

Microbial fermentation has long been adopted for value-added products production. To improve production yield and to achieve desired quality of target products. Our group aims to utilize the fermentation experience including bioreactor design, strain selection, and microbiological engineering to enhance the production of value-added products such as antimicrobials, organic acids, polysaccharides, and enzymes.

Our research team has investigated the health effects of fermented foods made from domestic crops. Current achievements include the physiological effect of allicin in black garlic, study of reduced salt miso and its inhibition on body fat formation, Chenopodium formosanum fermented beverages and their inhibiting roles in PM2.5-induced inflammation, body fat formation and delayed aging, rice screening for fermentation studies with koji bacteria, anti-inflammatory and antibacterial properties of hops, etc. In the publication of *PLOS ONE* (2021), different probiotics commonly used to produce fermented dairy products were inoculated independently for Chenopodium formosanum Koidz. fermentation. Lactobacillus plantarum BCRC 11697 was chosen because, compared to other lactic acid bacteria, it exhibits increased free radical scavenging ability and can produce more phenolic compounds, DPPH (from 72.6% to 93.2%), and ABTS (from 64.2% to 76.9%). Using RSM, we further optimize the fermentation protocol of BCRC 11697 to reach the highest level of antioxidant activity (73.5% of DPPH and 93.8% of ABTS). An increase in lower molecular weight (<24 kDa) protein hydrolysates was also observed. Results indicated that djulis fermented by L. plantarum can be a powerful source of natural antioxidants for preventing free radical-initiated diseases.

In the future, our team will continue to utilize agricultural crops with local characteristics to develop fermented products with personalized health benefits and provide value-added food materials for the elderly.

Dr. Kuan-Chen Cheng is a full professor of National Taiwan University and a supervisor of Taiwan Association for Food Science and Technology (TAFoST). He demonstrated outstanding research capability in his career reflected by his publication record of about 130 SCI-listed journal articles (6,304 citations and *h*-index of 35) in food-related fields.

Construction of the systems for sustainable food provision using insects in Japan

Tokyo University of Agriculture and Technology Hiroko Tabunoki

The United Nations projects that the world population will reach 9.8 billion by 2050, fueling concerns about sufficient food production to meet the growing demand. The need for more livestock to meet food demands raises concerns about livestock feed shortages. Therefore, the identification of new food resources has become an urgent concern.

It is estimated that more than one million species of insects exist worldwide. Insects exhibit various feeding habits, such as consumption of plant leaves and stem; flower nectar; tree body and sap; timber; fruit; and animal blood, carcass, and excrement. Typically, insect feeding behavior is species-specific.

The black soldier fly (BSF), *Hermetia illucens*, is a holometabolous dipteran insect that feeds on organic waste, including food scraps and animal manure. BSF larvae and pupae are potential sources of protein for livestock and could contribute to their growth. In recent years, the production of BSF as an organic waste-derived food resource has gained attention, and large-scale BSF production factories are operating in several countries. However, in Japan, large-scale breeding of BSF has been challenging, leading to a focus on small-scale breeding with added nutrient functionality as an alternative approach.

We investigated the expression of digestive enzymes in the midgut (It plays a role in like gastrointestinal tract in mammal) in BSF that were allowed to feed on different types of livestock manure. We identified an enzyme, a novel collagenase, which might help digest collagen. Our findings could contribute to the development of a system for treating target organic waste more efficiently.

In this talk, I will discuss the problems associated with BSF breeding in Japan as well as new information related to the use of a functional BSF strain based on the environmental health cycle.

Dr. Tabunoki is a specialist in biochemistry, especially in producing useful substances using insect enzymes. After previously working as a JSPS Research Fellow and Assistant Professor at Meiji Pharmaceutical University, she is currently a professor at the Institute of Agriculture.

Bioavailability of Pro-Hyp upon ingestion of collagen hydrolysate (CH) with the presence of rice protein hydrolysate (RPH)

Kyoto University¹ and Universitas Gadjah Mada² <u>Sri Wijanarti</u>^{1,2}, Kenji Sato¹

Several digestion-resistant peptides have been identified in human blood upon ingesting collagen hydrolysate (CH). Pro-Hyp is the major CH-derived peptide in human blood and has been demonstrated to be associated with the beneficial effect of CH, such as acceleration of wound healing. Ingestion of CH with other protein hydrolysates may affect the bioavailability of Pro-Hyp. However, the effects of non-collagenous peptides on the bioavailability of Pro-Hyp remain to be solved. This research aimed to elucidate the effect of the co-administration of rice protein hydrolysate (RPH) on the bioavailability and stability of Pro-Hyp in the rat.

Six-week-old male Wistar rats (Japan SLC) were divided into three groups (n=3 each group). The CH, CH+RPH, and control groups were orally administered CH at 200 mg/kg body weight, CH and RPH at the same dose for each hydrolysate, and water, respectively. Rats were sacrificed one h after oral administration. The portal blood, inner content and tissue of the small intestine were collected. Each peptide was identified and quantified using LC-MS/MS in total ion, precursor ion, product ion, and MRM scan modes.

One hour after ingestion, Pro-Hyp, Ala-Hyp, Ala-Hyp-Gly, Pro-Hyp-Gly, Leu-Hyp, and Ile-Hyp increased significantly in the lumen of CH and CH+RPH groups. Pyroglutamyl (pGlu)-peptides, including pGlu-Leu, pGlu-Tyr, and pGlu-Phe which were derived from RPH, significantly increased in the CH+RPH group. In the small intestinal tissue, a few peptides, including Pro-Hyp, Ala-Hyp, and Ala-Hyp-Gly, significantly increased, but no significant increase in the pGlu-peptides content. Interestingly, in the blood, Pro-Hyp significantly increased in the CH+RPH group (p<0.07) but not in the CH group, which suggested that the pGlu-peptides from RPH may suppress the degradation of PO in the rat. The present study indicates that Pro-Hyp can be degraded in the rat intestine, which can explain the low blood level of Pro-Hyp in rats compared to humans. The effect of co-administration of pilus-peptides with CH on the Pro-Hyp level in human blood remains to be solved.

Sri Wijanarti is a junior lecturer at Universitas Gadjah Mada and a student in the doctoral program at Kyoto University. Her study focuses on the bioavailability of collagen hydrolysate-derived peptides. She is an enthusiastic young researcher who enjoys research and learning.

A glance at current condition of functional foods in Indonesia: regulation, community, research and development

Research Center for Pharmaceutical Ingredients and Traditional Medicine National Research and Innovation Agency (BRIN) Agus Budiawan Naro Putra

The utilization of food for preventing nutrient-deficiency diseases was then becoming the starting-point of what we know now as healthy diet, and thus acted as a trigger for the development and construction of the terminology of "functional food". In relation with functional foods, the policy and/or regulations changes in Indonesia have been very dynamics. Indonesia had a functional foods regulation in 2005. It was known as the Regulation of the Head of Food and Drug Supervisory Agency (PERKA BPOM) No. HK 00.05.52.0685 concerning Provisions on Basic Functional Food Control issued in 2005. This was the first regulation which specifically mentioned the term "functional foods". However, the functional foods terminology was totally removed in the 2016 PERKA BPOM No. 13 concerning Supervision of Claims in Food Labels and Ads. As it is regulated in the newest regulation, the 2022 PERBPOM No. 1, Article 2 No. (1) - (3), there are 5 types of claims on label which are recognized by the Government of Indonesia: (1) Nutritional and Anti-nutritional Claim, (2) Health Claim, (3) Isotonic Claim, (4) Vegan Claim, and (5) Claims related with microorganisms. Although functional food is no longer known in the regulation, Indonesian researchers, academicians, and food industries remain actively sharing and developing functional food in Indonesia through Perhimpunan Penggiat Pangan Fungsional dan Nutrasetikal Indonesia (P3FNI) also known as Indonesian Society for Functional Food and Nutraceutical. Apart from that, Indonesian spices and herbs, jamu, and traditional fermented foods are still promising potential that is inevitable to be explored for human health and well-being.

Agus Budiawan Naro Putra is a researcher at the Research Center for Pharmaceutical Ingredients and Traditional Medicine, National Research and Innovation Agency (BRIN), Indonesia. He is interested in bioactive substances, functional foods, and medicinal plants.

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