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Dissemination of Synbiotic Tempe Extract Krenova Soygurt Products as Functional Drinks for Stunting Prevention through Community Partnership Programs

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Abstract

This activity aimed to educate the public about Synbiotic Tempe Extract Krenova Soygurt Products as Functional Drinks for Stunting Prevention. The implementation of activities as community service in the form of health education and counseling on stunting prevention involved 10 lecturers, 12 students along with 9 cadres and 30 people from the Cempaka Integrated Health Post, Wonorejo Village, Gondangrejo, Karanganyar Regency. The social community activity was carried out on August 26, 2024, and the community received a response and enthusiasm through active participation and involvement in the discussion and question and answer sessions. The essence of the implementation and dissemination of the benefits of synbiotic soygurt tempeh can function as a functional drink based on science and technology, halal and economical through a community partnership program carried out sustainably, completely, and meaningfully at the Cempaka Integrated Health Post, Wonorejo Village, Gondangrejo District, Karanganyar Regency to achieve the target of down streaming Kreova health products that are beneficial to the community and support the success of the Government's program in overcoming and reducing the incidence of stunting in Indonesia.

A. Introduction

Stunting is a condition characterized by a toddler's nutritional status when their height or length is deemed inadequate for their age (de Onis & Branca, 2016). Stunting toddlers fall under the category of chronic nutritional issues, which can be brought on by a variety of causes such as socioeconomic circumstances, maternal nutrition during pregnancy, baby sickness, and inadequate infant nutrition (Noor et al., 2022). According to data from the Indonesian Toddler Nutrition Status Survey (SSGBI) conducted in 2021, 5.33 million toddlers, or 24.4% of the population, are stunted. The percentage of people who are stunted has decreased from the previous year, although it is still rather significant. By maximizing efforts at the Integrated Service Post, the Indonesian government hopes to achieve its goal of 14% for the Stunting Reduction Program by 2024 (Radjulaeni et al., 2024). Diversifying the creation of new food formulations while taking into account nutritional factors, health benefits, acceptability, durability, and the advantages of local food resources might help optimize the management of nutritional issues in stunted children.

Functional food through diversification and fortification methods is one alternative in fulfilling balanced nutrition for children and pregnant women as a form of intervention against stunting. An alternative to

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fermented soy milk or soyghurt meals is the idea of synbiotics (prebiotics and probiotics) as functional food biosupplements, which can be utilized to stop stunting (Harti et al., 2015). It is anticipated that the synbiotic biosupplements used in yogurt will have immunostimulant effects and lower cholesterol levels as a multifunctional, affordable, and safe synbiotic dietary supplement.

Prebiotic tempeh, the result of research by Harti et al (2014) which has obtained a Patent granted IDP000050238 dated March 14, 2018; including multifunctional functional food because it is a natural synbiotic, antihypercholesterolemia, antihyperglycemia, increases immuno stimulants so that it is beneficial from a health aspect. The research results of Irdianty et al (2023) show that prebiotic tempeh extract as a raw material for making synbiotic tempeh extract soygurt as a functional drink for preventing stunting.

The output of Harti et al's Vocational Product Research (2023) is a prototype of synbiotic tempeh extract soyghurt as a krenova food product that has been registered with Patent P00202308518 dated September 6, 2023; has the potential to be developed and optimized as a standardized and certified food product to support the achievement of downstreaming and commercialization targets as a healthy and safe food krenova product, functional food and with a knowledge-based economy perspective through collaborative link and match partnerships with stakeholders, DUDI, and the community.

The paradigm of community service activities can be carried out through institutional, multidisciplinary link and match collaboration, related to the implementation and dissemination of synbiotic tempeh extract soyghurt krenova products as functional food for preventing stunting based on a knowledge-based economy; in order to achieve downstreaming and commercialization targets professionally; independently and sustainably. The UKH Surakarta implementation team has relevant expertise related to improving the quality of innovation of synbiotic tempeh extract-based soyghurt prototypes as functional food for stunting prevention through empowering vocational partnerships with conceptual descriptions of science and technology which are the final target of achievement, namely downstreaming and commercialization of Krenova product innovation.

Health education or counseling, cadre assistance and training carried out by the academic community (lecturers and/or students) to the community related to the implementation and dissemination of Krenova soygurt products with synbiotic tempeh extract as functional food for stunting prevention has never been carried out by Posyandu Cempaka, Wonorejo Village as a Foster Village of Kusuma Husada University Surakarta.

The results of research by the academic community of Kusuma Husada University Surakarta as an output of Intellectual Property and its benefits for the community, it is necessary to carry out implementation and dissemination activities for synbiotic tempeh extract soyghurt products as healthy and safe food products, functional food and with a knowledge-based economy perspective through community service activities with stakeholders.

The essence of the implementation and dissemination of the benefits of synbiotic tempeh soygurt can function as a functional drink based on science and technology, halal and economical and play a role in supporting the success of the Government's program in overcoming and reducing the incidence of stunting in Indonesia.

B. Methods

The activity carried out through the community service program are public health education on the health of soyghurt products, tempeh extract synbiotics as Krenova healthy and safe food products, and functional food for stunting prevention through empowerment of levels or health workers. The implementation of the PKM activity was carried out by the UKH Surakarta Implementation Team consisting of 10 lecturers, 12 students along with 9 cadres and 30 people from the Cempaka Posyandu community, Wonorejo Village, Gondangrejo, Karanganyar Regency.

Procedures of the activity:

a. Coordination between cadres or health workers at the Cempaka Posyandu, Wonorejo Village, Gondangrejo District, Karanganyar Regency with the Head of the UKH Surakarta Implementation Team regarding the schedule of activities to be carried out.
b. Coordination meeting of the implementing team of lecturers and students regarding the preparation of health education counseling tools and materials and the preparation of activity agendas, Counseling Event Unit materials, leaflets on stunting prevention

c. The implementation of PKM activities in the form of health education about soyghurt based on synbiotic tempeh extract as a functional food for preventing stunting, a product of the UKH Surakarta academic community Krenova, was carried out on August 26, 2024 at the Cempaka Integrated Health Post, Wonorejo Village.
d. Monitoring and evaluation were carried out by the Implementation Team through coordination with Partners and the Head of the Cempaka Integrated Health Post, Wonorejo Village, Gondangrejo District, Karanganyar Regency to discuss the evaluation of the community service activities that had been carried out.
e. Preparation of a report on community service activities as an accountability report for activities after the activity was completed.

C. Result and Discussion

PKM activities through health education and counseling about soyghurt products with synbiotic tempeh extract as a Krenova healthy and safety food product, functional food, knowledge-based economy for preventing stunting were carried out on August 26, 2024, involving the Implementation Team, namely 10 lecturers; 12 UKH Surakarta students along with 9 cadres and 30 community members of Posyandu Cempaka, Wonorejo Village, Gondangrejo, Karanganyar Regency. The activity received a response and enthusiasm from the community through active participation and involvement in the discussion and question and answer sessions.

The results of chemical and microbiological tests of synbiotic tempeh extract soygurt refer to SNI 7552:2009, which have been carried out in the laboratory of the Surakarta Goods Quality Testing and Certification Center (BPSMB) as listed in table 1.

Table 1. Results of Quality Tests of Synbiotic and Non-Synbiotic Tempeh Extract Soygurt

Test Parameters	Content % (b/b)				Quality Requirements SNI 2981:2009 SNI 01-2891-1992
	KB2	AA2	BB2	CC2	
Chemical Test					
Fat	0.044	0.045	0.037	0.035	Min 3.0
Milk solids	81.97	82.31	84.41	84.28	-
Milk solids non-fat	79.43	79.58	82.09	81.31	Min 8.2
Protein	6.69	6.38	6.55	6.23	Min 2.7
Ash content	0.55	0.76	0.64	0.69	Max. 1.0
Acidity	1.34	1.35	1,24	1.16	0.5 – 2,0
Sugar content	2.50	2.69	2.29	2.94	-
Metal contamination (mg/kg)					
- Lead (Pb)	0.25	0.12	0.12	0.12	Max. 0.3
- Mercuri (Hg)	< 9.6×10^{-5}	< 9.6×10^{-5}	< 9.6×10^{-5}	< 9.6×10^{-5}	Max 0.03
- Arsenic (As)	0.96	1.04	1.04	1.04	Max0.1
Microbiological test					
Coliform bacteria (APM/ml)	< 3 cells / 100 ml sample	< 3 cells / 100 ml sample	< 3 cells / 100 ml sample	< 3 cells / 100 ml sample	Max 10 / 100 ml sample
Salmonella sp/ 25 ml	Negative	Negative	Negative	Negative	Negative

Description: Chitosan 1%. Skim milk 15%. Inoculum 5%. AA2 = synbiotic tempeh extract + water = 1:1; BB2 = synbiotic tempeh extract + water = 1:2; CC2 = synbiotic tempeh extract + water = 1:3; KB2 = non-synbiotic tempeh extract + water = 1: 2.

Recently, the term "synbiotics," which refers to a combination of probiotics and prebiotics, has been used to describe supplements and foods that improve health as crucial human food components. Made from soybeans, soyghurt is one method of fortifying fermented yoghurt products based on vegetable protein. The market's well-known and accessible soyghurt is typically made from soybean seed extract alone, without the addition of synbiotics, and fermented with probiotics or BAL, such as Lactobacillus acidophilus, L. bulgaricus, and Streptococcus thermophilus, according to the findings of a survey conducted via an online application (Labiba et al., 2020). Soyghurt contains synbiotic biosupplements that are safe, effective, and affordable. It is anticipated that these supplements will lower cholesterol and have immunostimulant effects.

Soyghurt is a fermented soy milk product by Streptococcus thermophilus and Lactobacillus bulgaricus bacteria which are essential and active microbial species in symbiotic relationships and have been commonly used in the yoghurt making process (Khairani et al., 2024). Soygurt is yogurt made with soy extract instead of cow's milk. BAL (Lactic Acid Bacteria), which includes Lactobacillus plantarum, Bifidobacteria, and Streptococcus thermophilus, is a yogurt culture that can be used. Because tempeh contains prebiotics, it can be utilized as a raw material or substrate to make yogurt. The International Dairy Federation states that 106 cfu/ml of live probiotic bacteria is the very minimum required to have any effect on health (Marwati et al., 2022; Wardani et al., 2017).

The Hedonic method (preference) is typically used for food organoleptic quality testing, where 30 panelists evaluate criteria such as acidity, taste, and scent. A scale ranging from very dislike to very like is used to gauge the panelists' degree of preference for synbiotic tempeh yogurt. According to the findings of the organoleptic test, non-synbiotic tempeh soy yogurt exhibits a taste value of 4.17 - 4.87; texture 3.67 - 5.67 and aroma 4.00 - 5.00, whereas synbiotic tempeh extract soy yogurt with various inoculum types has a taste value of 3.83 - 5.00; texture 4.33 - 5.00 and aroma 3.83 - 4.83. This demonstrates that soy yogurt made using tempeh extract can be regarded as being on par with soy milk-based and cow's milk-based soy yogurt products that are used as benchmarks. With the addition of sugar and flavoring, full-cream milk-based yogurt products typically have a semi-solid consistency and a sweet and sour flavor. The isoflavone factor-2 components genistin, daidzin, and glycitin are linked to glucose as isoflavone glycosides during the prebiotic tempeh extraction process (Anggraini et al., 2021). Because it contains 3.5–4.0% protein and lacks casein, soy milk has nearly the same nutritional value as cow's milk. As a result, it can be used in place of cow's milk that has been fermented with BAL, a process known as soy yogurt. Soy milk contains different types of carbohydrates than cow's milk, namely lactose and glucose.

Yogurt manufacturing involves the lactic acid-forming bacteria Lactobacillus bulgaricus, Lactobacillus acidhopillus, and Bifidobacterium. In fermented milk, these three microorganisms convert lactose to lactic acid. Yogurt's lactose content will drop and its lactic acid content will rise as a result of lactic acid bacteria activity. Yogurt's acidity level is impacted by the production of lactic acid. Probiotic bacterial activity is powered by the breakdown of sugar in their cells, which results in the production of lactic acid, which gives food a sour flavor and causes coagulation.

The level of lactic acid in yogurt is also influenced by the amount of sucrose added (Zahid et al., 2020). Lactic acid buildup from LAB fermentation in the substrate affects the amount of acidity in the yogurt. While the pH of non-synbiotic tempeh extract soy yogurt ranges from 3.70 to 3.96, giving it a sour taste, the pH of synbiotic tempeh extract soy yogurt ranges from 3.76 to 3.98. The pH decreases with the amount of lactic acid generated by LAB fermentation, which affects the product's organoleptic properties, making it more sour and semi-solid in consistency. The reaction of calcium lactate production during the fermentation process by LAB results in a semi-solid consistency. Different fermentation procedures produce different acidity and scents. Excessive amounts of acidity are disliked by respondents. In order to boost milk consumption, the public will favor fermented milk with a moderate level of acidity. Even if other evaluation criteria are superior, consumers' final decision to accept or reject a food is heavily influenced by taste; if they don't like the food's flavor, they will reject it. The components in the ingredients and the fermentation process affect the final taste, allowing for the addition of extra ingredients flavored with strawberries, melons, grapes, oranges, peaches, and coloring in order to create flavored fermented milk drinks that appeal to both consumers and children.

The synbiotic and non-synbiotic tempeh extract yogurt's fat content percentage (b/b) is 0.035 to 0.045, its milk solids percentage (w/w) is 81.97 to 84.41, its non-fat milk solids percentage (w/w) is 79.43 to 82.09, its protein percentage (w/w) is 6.23 to 6.69, its ash content is 0.55 to 0.76, its acidity percentage (w/w) is 1.16 to 1.35, and its sugar content percentage (w/w) is 2.29 to 2.94, according to Table 1. and the established standard's minimum limit standards for lead, arsenic, and mercury metal contamination are met. The synbiotic yogurt tempeh product demonstrates that it satisfies the microbiological quality test criteria, which include having no Salmonella sp bacteria per 25 ml and MPN coliform <3 cells per 100 ml. This demonstrates the safety and healthfulness of the synbiotic soy yogurt tempeh product. Salmonella species, particularly Salmonella typhi, are dangerous bacteria that cause typhoid fever infections, while coliform bacteria are common flora bacteria in the human digestive tract. In order to define the quality of raw materials, manufacturing procedures, and product packaging as an indicator of safe, hygienic, and healthy food items when ingested by customers, microbiological testing of food products must be conducted.

Stunting is still a health problem in the country. One of the causes of this growth failure condition is a lack of nutrient intake (malnutrition) (Beckmann et al., 2021). Stunting prevention is usually focused on

improving nutrition, especially micronutrient intake. Several studies have reported that micronutrient interventions cannot prevent stunting. Gut microbiota plays an important role in nutrient absorption and accelerates the improvement of nutritional status to support the growth and development of stunted children (Soliman et al., 2021). Modulation of the diversity of gut microbiota composition is now one of the treatment targets to overcome dysbiosis that causes infection by inhibiting the growth of pathogenic bacteria, increasing immune responses and digestive tract health so that nutrient absorption increases (Koshy et al., 2022; Mulyaningsih et al., 2021).

The development of the potential of prebiotic soyghurt tempeh as a functional drink for stunting prevention due to its high vegetable protein content, is expected to significantly increase the number of probiotic bacteria in the intestine which has an impact on improving glucose tolerance, improving insulin secretion due to glucose induction and reducing proinflammatory cytokinins in plasma. Therefore, the concept of synbiotics in functional foods is an alternative to be developed in fermented soy milk or soyghurt foods so that they can be used to prevent stunting.

The potential of prebiotic soyghurt tempeh as a krenova food product and multifunctional health drink, namely high nutritional content as a source of vegetable protein, antihyperglycemia and antihypercholesterolemia related to improving the profile of intestinal microbiota and metabolic diet management. Implementation of the essence and benefits of krenova products from research by the UKH Surakarta academic community through collaborative link and match partnerships with stakeholders, DUDI, and the Community which are managed professionally; independently; sustainably, and have a knowledge-based economy perspective to support the success of the Government's program in overcoming and reducing the incidence of stunting in Indonesia.

The results of the analysis of the nutritional content and quality of synbiotic soygurt tempeh products based on SNI 7552: 2009 meet the requirements as flavored fermented milk that can function as a functional drink and has the prospect of being developed as a standardized and certified Krenova product and achieving the target of being downstreamed and commercialized.

Synbiotic tempeh extract soygurt is a krenova food product resulting from research by the academic community of Kusuma Husada University Surakarta which has met the quality test for standardized and certified functional drinks; has the potential to be downstreamed and commercialized to support the success of the Government's program in overcoming and reducing the incidence of stunting in Indonesia.

D. Conclusion

Dissemination and implementation of prebiotic tempeh soygurt as a krenova product for stunting prevention based on the principles of knowledge-based economy product, healthy and safety food, functional food, fun for diet and one for all which is effective, safe, and halal with higher commercial value and potential economic sources; has been carried out through a community service activity program at Posyandu Cempaka, Wonorejo Village as a Foster Village of Kusuma Husada University Surakarta.

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