CERTIFICATE OF PARTICIPATION

ASIC 2018
FACULTY OF AGRICULTURE
UNIVERSITAS ANDALAS

Presented to

Helmizar

as Presenter

In

AGRIFOOD SYSTEM INTERNATIONAL CONFERENCE

"Agrifood system towards Agriculture 4.0 and delivery of Sustainable Developments Goals (SDGs)"

Padang, West Sumatera, Indonesia, 4-6 September 2018

Dean, Faculty of Agriculture
Universitas Andalas

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Development of Local Food Product From *Dadih* as a Complementary Feeding to Prevent Children Stunting in West Sumatera, Indonesia

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Abstract

The goals of the study: The aim of this research is to produce pasteurized *dadih* powder and a best condition for its production for formula supplementation and developed formula complementary feeding using local food source to prevent stunting in children.

Methodology: The characteristics of *dadih* were analyzed by biochemical and daily intake convering percentage. Both of *dadih* and *dadih* powder were analyze with proximate, pH and the total of lactic acid bacteria. The test of organoleptic have been conducted to choose best formula included test of physical properties for kamba density test and water absorption, test laboratory for chemical contain, mineral zinc, iron, calcium contain and analysis of nutrient according to recommended nutrient requirements for children under two years of aged. The nutritional composition formulas was analyzed using Nutri Survey Programme and list of nutritional composition of local food. Anthropometric measurements of 126 children were taken to classification of nutritional status or stunting. For body weight measurement, children were wearing light clothes without shoes, using an electronic scale with a precision of 0.1 kg. The recumbent length of the children was measured using a length board with a precision of 0.1 cm.

Results and discussion: The calorie of *dadih* is 95.51 kcal with 31.8 g protein, 34.11 g fat and 29.6 g carbohydrate in 100 gram product. The formula complementary food *dadih* was adjusted for children under two years of age groups and provided approximately 200 to 250 kcal of energy and 6 to 8 gram of protein. *Dadih* powder was obtained by freezing technology and the use of vacuum heating to stabilized the powder. The nutritional composition of the formula complementary food *dadih* were standardized according to nutrition recommendations for children in the two age categories. From the anthropometric measurement of nutritional status was found 15.9 % children stunting, 10.3 % underweight and 3.2 % wasting.

Conclusion and implication: The *dadih* powder was produce as a supplementary food combined with local food source with appropriate nutritional content and probiotic for use as complementary food to prevent stunting children.

Keyword: *Dadih* powder, daily intake, Complementary Feeding, Stunting, Children

Introduction

Dadih is a functional food from West Sumatera Province Indonesia that is produced through spontaneously fermentation of buffalo milk in bamboo. It has a thick consistency and slightly sour taste. Lactose buffalo milk is fermented by bacteria to produce lactic acid. It is coagulated with casein, then turns it into a yogurt-like white tofu.

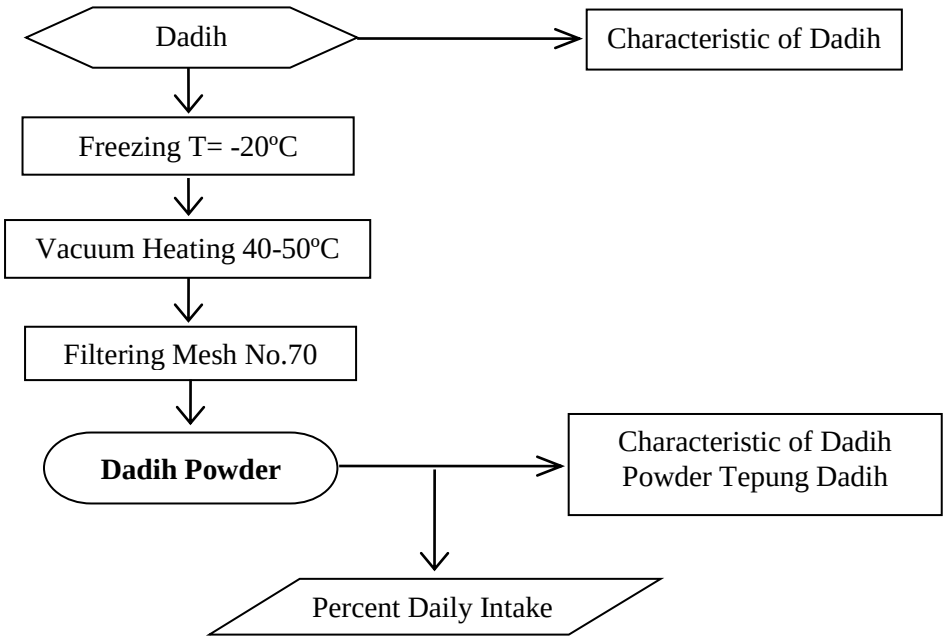
Dadih is categorized as functional because of its nutritional contents, which provide health benefits. The functional value of dadih is lactic acid obtained from a bacteria known as probiotics. *Lactobacillus sp.* is the probiotics of *dadih* with high lactic acid production. Some research results suggest that probiotic is able to survive in human digestive tract. Health benefits are gained when consuming probiotics regularly in an amount of 10^6-10^7 cfu/ml.

The main benefits of consuming probiotic of dadih are: the increase of immunity due to intestinal infections, improvement of lactose digestion, mineral absorption, vitamin synthesis and protein digestion. Inadequate nutritional intake and infectious diseases can cause stunting. The quality and quantity of protein and micronutrients such as zinc, calcium, phosphorus, iron are vital to infants and children. The effectiveness of these nutrients will lead to a healthy digestive tract. Therefore, dadih can be used as an alternative food supplement for Infants.

The serving of dadih in a bamboo tube usually causes it to smell. The odor comes from the fermentation process of buffalo milk mixed with the smell of bamboo. This causes the low acceptability of dadih powder. Processing is carried out to preserve nutrition, storage and transportation. The powder used for both commercialization and health purposes has widely been applied. However, transforming dadih into powder has not been developed. Based on this, it is necessary to turn dadih into a powder that can be applied to food supplement formula. The aim of this research is to produce pasteurized *dadih* powder and a best condition for its production for formula supplementation.

Material and Methods

This research was conducted in two steps, namely characteristics of dadih and the transformation of dadih powder to nutritional compound.



Flowchart of Research Steps

The production of *dadih* powder aims to characterize dadih powder and its stability. Fermented Dadih powder can enrich infant food supplement to achieve probiotic daily intake. Raw material used is spontaneous fermented dadih after 48 hours. Transformation technic used is freezing method to sustain probiotic. Dadih was flattened in 1cm deep plates and was frozen at -20ºC for 2 days. The frozen dadih was stabilized by using a vacuum oven heating at a temperature of 40-50ºC for 5-10 minutes until the obtention of a moisture content of 5% based on milk powder quality standart (SNI 2970: 2015).

Characteristics both of dadih and dadih powder were analyze with proximate, pH and the total of lactic acid bacateria. Water content was analyzed by thermo gravimetric method, protein content was processed by Kjeldahl method, fat content was analysed by Soxhlet extraction method by using hexane, ash content was studied by dry-ashing method, and carbohydrate content was examined by using the difference method. For pH testing, 3 grams of sample were mixed with 3 mL dH2O in a beaker glass, then tested with a pH meter. Calibration of the pH meter

was performed at pH 4 and 7 by using a buffer solution. Total lactic acid bacteria was calculated based on total plate numbers by using MRS agar medium.

The last step was the counting of daily intake percentage. The determination of calorie was calculated by using 4:4:9 kcal/g conversion, then counted by using *Nutrisurvey 2007* software base on protein: carbohydrate: fat component.

Results and Discussion

At the initial stage anthropometric measurements were carried out in 126 children who were followed up from birth, who pregnant mothers had been given *dadih* since the second trimester for 6 months intervention from the study before (Helmizar, 2018). The children were followed up at 6 to 8 months of aged to obtain data on nutritional status and prevalence of stunting as shown in table 1.

Table 1. The Nutritional Status of Children at Follow-up (N=126)

No	Nutritional Status	n	%
1.	Under weight (Weight for age Z- Score WHO Anthropometrics)	13	10.3
2.	Stunting (Height for age Z-Score WHO Anthropometrics)	20	15.9
3.	Wasting (Weight for Height Z- Score WHO Antropometrics)	4	3.2

Based on Table 1 shown the nutritional status of children at follow-up are stunting 15.9 percent higher than prevalence underweight 10.3 percent and wasting 3.2 percent. This prevalence of stunting is lower than data Basic Health Research Ministry of Health in West Sumatera Province that founded 27.9 percent prevalence stunting in chindren under two year (MOH, 2007). From conception until two years of age, children grow and develop rapidly and nutritional demands are high. Most of the growth faltering happens in this period of life, and low birth weight contributes to early faltering. Early life interventions to prevent growth failure and to support optimal growth and development of children are therefore crucially needed (Martorell et al.2009). Further Intervention for stunting children crucially needed will able to improve the nutritional status, which showed an decrease in the proportion of stunting children .

Dadih analyzed in this study is dadih obtained from a buffalo farm in Agam District. Dadih can be found in west Sumatera Province, Indonesia, where buffalo milk production is more popular than the production of cow milk. Buffalo milk contains higher calcium and protein than cow milk. Additionally, buffalo milk protein is more resistant to heat treatment (Akgun, et al. 2016). This is in line with the research of Salman et al. (2014) who argue that buffalo milk has high calorie value and is well used as raw material for dairy products with nutritional value. The amount of calorie obtained in this study is 95.51 kcal, while the chemical characteristics of dadih are: total solid: 19.56 percent, protein: 7.95 percent, fat: 3.79 percent, and carbohydrate: 7.40 percent. Daily intake, base on water convection, is shown in table 2. This compound is lower than our previous research which showed that dadih from Agam district has 237.68 kcal (Helmizar et al, 2017).

Table 2. The Nutrient Contents of Dadih per 100 gram

No	Nutrient Contents	Nutrition (g)
1	Protein	31.8
2	Fat	34.11
3	Carbohydrate	29.6
4	Calory	95.51

The protein content of dadih in this study is higher than that of other buffalo milk estimated to 4.49% (Han et al., 2012). Soomro et al. (2012) also reported that the total solids of buffalo milk dadih were 13.66 percent, with 3.6 % fat content, 4.01 percent protein content and 5.09 percent carbohydrate content. The higher the nutrient contents in dadih, the better the consistency of dadih in the formation of texture and the increase of softness of dadih. Dadih has a white tofu-texture, and a yogurt like-smell. Soft and smooth dadih texture increases consumer preference compared to fresh milk (Ishak et al., 2006).

The total solids of dadih can be increased by activating peroxidase enzymes that are found in fresh milk (Soomro et al., 2012). Peroxidase enzyme provides an antimicrobial effect to inhibit lactic acid bacteria converting lactose into lactic acid during the fermentation process. The dadih used in this study comes from fresh buffalo milk not pasteurized in a bamboo. All of this causes low peroxidase concentrate and high total solid content.

The fermentation of dadih occurs naturally due to the content of lactic acid bacteria in bamboo. Total lactic acid bacteria found in the final product was 4.6 × 10^6 CFU/ml. *Enterococcus faecium* and *Lacotobacillus plantarum* are two strains of lactic acid bacteria from dadih and are potential probiotic (Surono, 2015). *L. plantarum* has more potential as a probiotic than *L. lactis* subsp*. lactis* and *E. faecium* (Collado et al., 2007; Yatmiko et al., 2017).

In this study, dadih powder was processed by using a temperature of -20ºC for 40 hours. Dadih evaporates as water decreases during freezing for 8-10 hours. Continued freezing for the second 8-10 hours will result in the decrease of bound water from dadih. Whereas to produce dry dadih, it takes a cooling time of 10-18 hours (Kennas et al., 2018).

The next stage is the vacuum heating to prevent sinneresis in the final product. The temperature used is proportional to glucose and galactose contents. Lower temperature of 35ºC results in lower glucose and galactose than the use of a temperature of 38ºC (Kennas et al., 2018). This is in line with the research of Lira de Medoires (2014) who argues that drying process, a temperature of 42-46ºC is used.

Dadih powder is beneficial in maintaining probiotic, reducing water activity (Aw), and reducing transportation costs. *Bacillus* groups are more resistant in processing treatment athough probiotic decreases each 3 logarithmic if stored for 30 days (Lira de Medoires, 2014). The processing of dadih powder by using freezing method can reduce the viability of *S.thermophilus* from 10^9 CFU/ml to 10^7 CFU/ml while *L. bulgaricus* from 10^6 CFU/ml to 10^4 CGU/ml (Marchal et al., 2009).

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