

DEVELOPMENT OF EMERGENCY FOOD PRODUCTS FROM VARIOUS FLOUR OF CEREALS, TUBERS, PULSES, AND LOCAL FRESHWATER FISH FROM INDONESIA

Sumarto*, Ani Radiati, Deris Aprianty, Irma Nuraeni, Ima Karimah

Department of Nutrition, Poltekkes Kemenkes Taskmalaya (Health Polytechnic of Tasikmalaya),
 Tasikmalaya, Indonesia

Health And Disaster Emergency (HADE) Center, Center of Excellent (CoE), Poltekkes Kemenkes
 Taskmalaya (Health Polytechnic of Tasikmalaya), Tasikmalaya, Indonesia

Emails: sumarto@dosen.poltekkestasikmalaya.ac.id, ani.radiati@yahoo.com,
 derisaprianty@yahoo.com, irma.nuraeni@dosen.poltekkestasikmalaya.ac.id,
 ima.karimah@dosen.poltekkestasikmalaya.ac.id

ABSTRACT:

The research aim was to develop emergency food products (EFPs) using raw materials of local flour from Tasikmalaya, West Java, Indonesia. The flour of cereals (Hanjeli and Corn), tubers (Cassava and Sweet Potatoe), pulses (Garut and Mung Bean), and freshwater fish (Tilapia and Catfish) were processed into the EFPs in the form of cookies and food bars. The purpose of the research was to produce a variety of EFPs from raw materials of various flour of cereals, tubers, pulses, and local freshwater fish at Tasikmalaya Regency which have adequate nutritional content, organoleptically acceptable, and meet the quality requirements and standards. The research was carried out experimentally and conducted in the food processing and sensory evaluation laboratory. The result were cookies and food bar meet the EFP requirements, especially in the total calorie content (248.54-252.82 kcal/ 50 g). Fat content were 44.20-47.92%, carbohydrate content were 44.50-48.70%. Protein content were 7.10-7.90%. In addition, the products have high levels of Iron (2.63-3.85 mg), Zinc (1.28-1.79 mg), and Calcium (190.05-231.06 mg) per 50 g to meet the needs of the disaster victims, including vulnerable groups and stunted children. The products were favored by panelists in all parameters of color, aroma, taste, and texture with a value above 4.5 (scale of 1-7).

Keywords: emergency food product (EFP), local food flour, nutritional content, organoleptic, stunted.

Article History

Received	: 10 February 2023
Revised	: 10 March 2023
Accepted	: 26 March 2023
DOI	: xxxx

INTRODUCTION

Several countries in the world are prone to disaster, including Indonesia. Indonesia is a country located within the Pacific Ring of Fire and has dozens of active faults. The condition causes Indonesia to become an area prone to earthquakes and volcanic eruptions, as well as several disasters that accompany them such as the tsunami. The territory of the Republic of Indonesia has geographic, geological, hydrological and demographic conditions that allow disasters to occur. Such Tasikmalaya Regency is the second most prone areas for natural disasters in Indonesia (BNPB, 2019).

The impact of disasters, whether natural, non-natural, or social conflicts, are emergencies in all fields including health and nutrition emergencies. Effect of disasters are nutritional problems such as malnutrition in infants and toddler. Babies do not get breast milk because they were separated from their mothers. The impact of disasters can also worsen the nutritional status of community groups. Food aid that was often late, unsustainable, and limited availability of local food can exacerbate disaster conditions. Another problem is food aid that have expired, mislabelling, or not halal information. Therefore, nutrition management in disaster situations is an important part of dealing with refugees quickly and accurately.

Stunting is also a nutritional problem that can be categorized as a disaster. According to Indonesian Basic Health Research (Riskesdas) data in 2018, the

prevalence of stunting on children under five in Indonesia is still high, namely 30.8% (Badan Penelitian dan Pengembangan Kesehatan, 2018). According to the results of the 2017 Nutrition Status Monitoring, Tasikmalaya City has a 38.2% higher prevalence of stunting than West Java Province (Direktur Gizi Masyarakat Kemenkes RI, 2018). The results of research on stunting children showed that their micronutrient consumption was low (Sanin et al., 2018).

Many efforts have been made to combat stunting. For example, supplementary feeding to 83.4% of underweight children in 2017 in Tasikmalaya City (Dirjenkesmas, 2017). Although, the food was not specific for stunting toddlers. However, based on studies, countries with lower middle income, including Indonesia, the variety of complementary foods for breastmilk for their children was less varied. The dominant foods were cereals and have a low nutrient density (Brown et al., 1998). The foods were generally lacking in animal protein sources and low in vitamin A, zinc and iron which are beneficial for the growth of toddlers (Arimond & Ruel, 2004).

The disaster management, both of natural as well as epidemic disasters, especially malnutrition, can be carried out by providing management of food products based on local resources. The food must be in accordance with the local culture, available and affordable raw materials in the area, reproduction of these foods in easy and low cost, and have nutritional

value and quality according to the nutritional needs of the target group, emergency food requirements and compliance to standards. Emergency food products (EFP) made can be in the form of food for buffer stock or food for processing in public kitchens (Sumarto, Listianasari, et al., 2018). Examples of emergency food products that can be used as buffer stock and have a long shelf life are cookies and food bars. The manufacture of EFP has been researched in Indonesia and other country (Ekafitri & Faradilla, 2011), (Kusumastuty et al., 2015), (Anandito et al., 2016), (Hermayanti et al., 2016), (Nurhayati et al., 2018), (Aini et al., 2018), (Sumarto & Tajrifani, 2020), and other countries (Zahra et al., 2014), (Mohebi et al., 2019).

The EFPs from research results showed that generally have not considered the requirements for stunting children, not all of them come from local raw materials, and have not considered the acceptable of the process of making products from flour (Ekafitri & Faradilla, 2011), (Kusumastuty et al., 2015), (Anandito et al., 2016), (Hermayanti et al., 2016), (Nurhayati et al., 2018), (Aini et al., 2018), (Zahra et al., 2014), (Mohebi et al., 2019). The form of flour will facilitate the process and uniformity of the formulation on EFP. In addition, the form of flour also has a long expire date. The production of EFP needs to maintain micronutrients (minerals) from local raw materials (Devi, 2015).

On the other hand, Tasikmalaya has the commodities potentially developed as raw materials for making EFP. The results of

the study showed that the food crop commodities which superior in Tasikmalaya district were corn (*Zea mays* var. *amylacea*), cassava (*Manihot esculenta*) and sweet potato (*Ipomoea batatas*) (Hikmahwidi, 2018). In addition, local commodities produced by West Java Province, especially the districts and cities of Tasikmalaya, are Hanjeli (*Coix lacryma-jobi* L.), Garut Beans (*Phaseolus vulgaris* L.) and Mung Beans (*Vigna radiata*). Tasikmalaya is a large supplier of freshwater fish. Local freshwater fish cultivated in the city of Tasikmalaya include Tilapia (*Oreochromis mossambicus*) and Catfish (*Clarias gariepinus*) with a potential of 261.64 tons and 519.05 tons respectively in 2009. The fishes are contain the nutrients needed for stunting toddlers, such as protein and minerals Iron (Fe), Zinc (Zn), and Calcium (Ca) (Ferraz De Arruda et al., 2006), (Mitra et al., 2017).

For this reason, it is necessary to conduct research by developing food products with raw materials of flour from cereals, tubers, pulses, and local freshwater fish from Tasikmalaya as food for emergency conditions including for stunting. The intervention by empowering local resources will run more effectively and efficiently in preparing a more diverse emergency food buffer stock. In addition, the product is expected to be used in programs for preventing and overcoming stunting with the uniqueness of the Tasikmalaya area and others city and others country. The product development can be implemented in other areas that have the potential for regional resources like

Tasikmalaya, West Java, Indonesia and others country.

The purpose of this research was to produce a variety of EFPs from raw materials of various flour of cereals, tubers, pulses, and local freshwater fish at Tasikmalaya Regency which have adequate nutritional content, organoleptically acceptable, and meet the quality requirements and standards. The products are expected to solve the problem of food and nutrition in disaster areas in Tasikmalaya Regency, West Java Province, Indonesia, and the world.

RESEARCH METHODS

The raw materials used to make EFPs come from the local Tasikmalaya and West Java. The raw materials used were the flour of cereals Hanjeli (*Coix lacryma-jobi* L.) and Corn (*Zea mays* var. *amylacea*). Tubers were Cassava (*Manihot esculenta*) and Yellow Sweet Potatoes (*Ipomoea batatas*). Pulses were Garut Beans (*Phaseolus vulgaris* L.) and Mung Beans (*Vigna radiata*). Freshwater fish were Tilapia (*Oreochromis mossambicus*) and Catfish (*Clarias gariepinus*). All raw materials come from local Tasikmalaya and West Java. All raw materials were local varieties. Raw materials were obtained directly from farmers or traders whose places of harvest were known.

This research was exploratory experimental research, which was analyzed descriptively and analytically. In this study, EFPs were made from variety of flour. The variables measured in this study were

organoleptic properties, macronutrient content, and the content of several micronutrients. The organoleptic parameters measured were color, aroma, taste, and texture. Macronutrient parameters were measured by proximate test consisting of energy content, carbohydrates, fat, protein, water content, and total minerals. Micronutrient parameters were measured by standardized tests, such as AAS, namely iron (Fe), zinc (Zn), and calcium (Ca). The experimental design scheme in this study can be seen in Table 1.

Table 1. Experimental design

Repetition/ Panelist	Treatment/ Sampel Order	
	A	B
1	1	2
Code	382	198
2	2	3
Code	777	255
<i>Etc.</i>	-	-

Each cookies and foodbar product was divided into 2 formulas, namely formula A and formula B. Each formula was a mixture of cereal flour, tubers, nuts, and freshwater fish. Formula A consist of hanjeli flour, sweet potato flour, Garut bean flour, and tilapia fish flour. Formula B consist of corn flour, cassava flour, mung bean flour, and catfish flour. The organoleptic test used a randomized block design according to Table 1 (Meilgaard et al., 2016). Determination of the formulation of EFPs was carried out by first calculating all ingredients of EFPs so that per 50 g of the product. The ingredients have to meet the nutritional

content in accordance with the EFP requirements and the principle of mass balance.

At an early stage, the formulas were made by estimating the macro nutrient content according to the EFP requirements. There were two types of formulas, namely formula 1: Hanjeli flour, Sweet Potato flour, Garut bean flour, and Tilapia fish flour. Formula 2: Corn flour, Cassava flour, Mung bean flour, and Catfish flour. Each formula was made Cookies and Food Bar products. The formula of catfish head and body flour used was in accordance with the formula used in the study of making cookies, namely 3.5% fish body meal and 1.5% fish head meal (Mervina, 2009). The formulas in this research take be seen in Table 2.

Table 2. Formula of emergency food product

Ingredient	Weight (gram)			
	Cookies 1	Cookies 2	Food bar 1	Food bar 2
Hanjeli flour	55	-	55	-
Sweet potato flour	25	-	25	-
Garut bean flour	15	-	15	-
Tilapia fish flour	4.75	-	4.75	-
Corn flour	-	40	-	35
Cassava	-	15	-	20

flour				
Mung bean flour	-	40	-	40
Catfish body flour	-	3.32	-	3.32
Catfish head flour	-	1.30	-	1.30
Amount of Flour	100	100	100	100
Margarine	55	55	55	55
Sugar	35	35	30	30
Egg	10	10	-	-
Baking powder	1	1	-	-
Vanilla flavor	1	1	-	-
Yolk egg	-	-	10	10
Skim milk powder	-	-	5	5
Total	202	202	200	200

The research was conducted in the Food Processing and Sensory Evaluation Laboratory of the Department of Nutrition, Health Polytechnic of Tasikmalaya. Nutritional analysis of EFPs was conducted at the Laboratory of PT Saraswanti, Bogor, Indonesia. The research was conducted in April-October 2019.

The research protocol was approved etchical clearance by Health Research Ethics Commission of Malang State Polytechnic of

Development of Emergency Food Products From Various Flour of Cereals, Tubers, Pulses, and Local Freshwater Fish From Indonesia

Health Ministry of Health, Republic of Indonesia. The complete research Steps have seen in Figure 1.

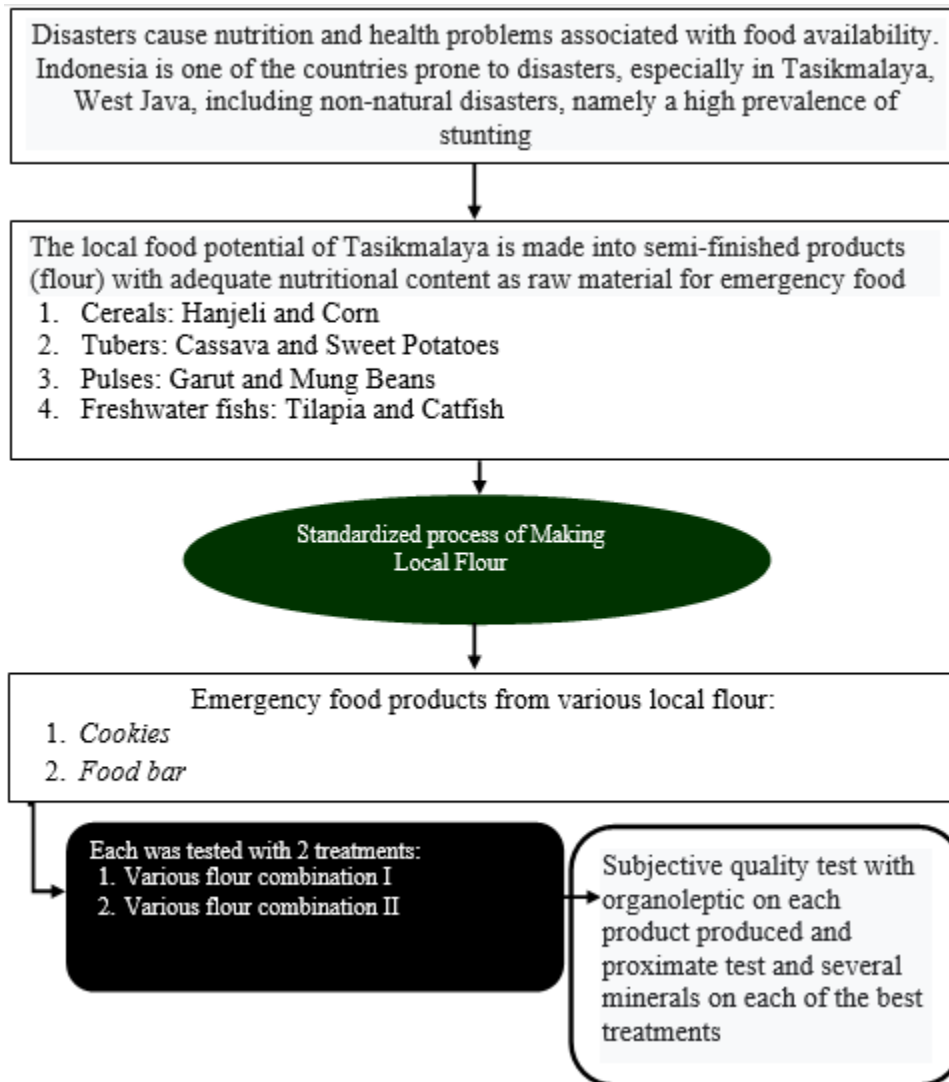


Figure 1. Research steps development of local emergency food product from Tasikmalaya, Indonesia

The first step in making a Cookies was to mix sugar and margarine until well blended. Then, the eggs and vanilla were mixed. Next, the dry ingredients and flour were added to the dough. Salt and baking powder were added to the mixture. Then, knead the dough until it was smooth by hand and the dough was molded. After

that, the dough was baked in the oven with a temperature of 180°C for 15 minutes.

The first step in making a Food Bar was mixing egg yolks and sugar. Then, add vanilla and margarine and then mix again. Next, mix dry ingredients or flour until evenly distributed. Salt and baking powder were added to the mixture. After that,

knead the dough and then mold the dough. The dough was baked in the oven.

Organoleptic properties of emergency food products were measured by the hedonic test method. There were 70 panelists participated in this study as untrained or consumer panelists. The number of panelists according to the requirements in the organoleptic test using the consumer preference method must be carried out by at least 70 panelists (Meilgaard et al., 2016).

Nutrient analysis of emergency food products was carried out on macronutrients and some minerals. Water content of samples was determined by drying at $103 \pm 2^\circ\text{C}$ until they reached constant weight (AOAC, 925.40) and Indonesian National Standard (INS) (AOAC 925.40, 1925) (BSN, 2011). Protein content was measured by the Kjeldahl method (Kjeltec 2300II, Foss, Sweden) (AOAC 2001.11, 2001). Total ash was determined by using dried samples following the AOAC method 950.49 (AOAC 950.49, 1950) and Indonesian National Standard (BSN, 1992).

The samples were then weighed, and the crucible was transferred to a muffle furnace. The temperature was preheated to 525°C , and the samples were ashed for 4 h to a white powder. The crucibles were transferred into desiccators, cooled, and weighed. Total fat was extracted with n-hexane (60°C) for 8 h using a Soxhlet apparatus (AOAC method 948.22) (AOAC 948.22, 1948). Hexane was separated by evaporation at room temperature. The flasks were cooled, and the crude fat was

weighed. Mineral elements of all the emergency food product were determined according to the following methods: Fe, Ca, and Zn (18-13-1/MU/SMM-SIG (ICP OES), atomic absorption spectrometry) (SIG, 2019).

RESULTS AND DISCUSSION

A. Formulated Cookies and Food Bar as Emergency Food Products

The products produced from this research were in the Cookies and Food Bar form with each formula can be seen in Figure 2.



a. Cookies



b. Food Bar

Figure 2 Emergency food products (Formula 1: Hanjeli flour, sweet potato flour, Garut bean flour, Tilapia fish flour; Formula 2: Corn flour, Cassava flour, Mung bean flour, Catfish flour)

Based on the Guidelines for Nutrition Management in Disaster

Management, it was explained that according to the Indonesian National Standard on humanitarian services in disasters No. SNI 7937: 2013 states that several requirements for providers of food security, nutrition and food aid, providers obliged to: 1). Protect the safe and appropriate feeding of infants and children for affected populations by implementing main policy guidelines and stronger coordination, 2). Ensuring the fulfillment of the nutritional needs of the population affected by disasters, including those most at risk, 3). Provide suitable and acceptable food which efficiently and efficiently used at the household level (Ditjen Kesmas Kemenkes RI, 2018). Based on this reason, the development of cookies and food bar emergency food product was very appropriate as a reserve food that can be consumed by residents with a disaster impact, especially for groups at risk.

The development of local food as raw material for emergency food was in line with studies carried out in Iran. The characteristics need to be considered in food aid were nutritional and functional aspects. These characteristics include aspects of food diversification, nutritional needs of target groups, and local culture (Mohebi et al., 2019). In the same place, food service management in

the emergency of natural disasters should consider formulas and food, food safety and health, food diversification, and cultural norms (Ainehvand et al., 2019).

The food bar product developed in this study was similar on nutritional value to the energy bar product developed by researchers from Iran for military consumption purposes. The results of energy bar from the research still safe for consumption for 6 months of storage at 38 °C or 36 months at 27 °C (Farajzadeh & Golmakani, 2011). Similar products have also been assessed. The product for the military was the same as for food for emergency disasters (Hadi et al., 2018).

B. Nutritional Content of Emergency Food Products

The emergency food products were then measured for its macro and micronutrient content. Macronutrients measured were total energy, carbohydrates, fat, protein, moisture content, and ash content. Micronutrients measured in the emergency food produced were minerals iron (Fe), zinc (Zn), and Calcium (Ca). The complete macro and micronutrient content of emergency food products from this study can be seen in Table 3.

Table 3. Nutritional content of emergency food product per 50 g

Table 3. Nutritional content of emergency food product per 50 g

Nutrient	Unit	Emergency food product formula (Per 50-gram end-product)								Requi-rement**
		Cookies 1		Cookies 2		Foodbar 1		Foodbar 2		
		$\bar{A} \pm SD^*$								
Calories	kcal	248.54	$\pm 0.14^a$	250.17	$\pm 0.25^a$	252.82	$\pm 0.19^a$	251.17	$\pm 0.24^a$	233-250
Calories from fat	kcal	109.85	$\pm 0.13^a$	117.72	$\pm 0.13^a$	121.16	$\pm 0.22^a$	119.18	$\pm 0.73^a$	
Total fat	gram	12.21	$\pm 0.01^a$	13.08	$\pm 0.01^a$	13.46	$\pm 0.02^a$	13.24	$\pm 0.08^a$	
	(% from calories)	44.20		47.06		47.92		47.45		35-45
Carbo-hydrate	gram	30.26	$\pm 0.10^a$	28.44	$\pm 0.02^a$	28.13	$\pm 0.06^a$	28.04	$\pm 0.14^a$	
	(% from calories)	48.70		45.47		44.50		44.65		35-45
Protein	gram	4.41	$\pm 0.10^a$	4.68	$\pm 0.05^a$	4.79	$\pm 0.05^a$	4.96	$\pm 0.02^a$	
	(% from calories)	7.10		7.47		7.57		7.90		35-45
Ash	gram	1.50	$\pm 0.02^a$	1.59	$\pm 0.02^a$	1.47	$\pm 0.02^b$	1.64	$\pm 0.02^b$	
Water	gram	1.63	$\pm 0.01^a$	2.22	$\pm 0.02^a$	2.15	$\pm 0.01^a$	2.12	$\pm 0.02^a$	
Iron (Fe)	mg	2.89	$\pm 0.04^a$	3.85	$\pm 0.04^a$	2.63	$\pm 0.01^b$	3.59	$\pm 0.06^b$	
Zinc (Zn)	mg	1.46	$\pm 0.01^a$	1.68	$\pm 0.00^a$	1.28	$\pm 0.02^b$	1.79	$\pm 0.02^b$	
Calcium (Ca)	mg	195.05	$\pm 1.69^a$	190.40	$\pm 0.12^a$	231.06	$\pm 0.04^a$	215.84	$\pm 2.31^a$	

Note:

Formula 1: Hanjeli flour, sweet potato flour, Garut bean flour, Tilapia fish flour

Formula 2: Corn flour, Cassava flour, Mung bean flour, Catfish flour

*Mean values with different superscripts within a column are significantly different ($p < .05$) **Reference: (Zoumas et al., 2002).

The cookies and food bars belong to the biscuit group. According to the Indonesian National Standard (INS), biscuits are a type of food made from wheat flour with the addition of other food ingredients, by heating and forming process. Biscuits are processed by roasting until the moisture content is not more than 5%. Biscuits are easy to carry because of their small volume and weight and their relatively long shelf life. According to the research results, cookies and food bars have a moisture content of 1.63-2.22%, which indicate that the product in accordance with INS. A packaging of emergency Food Product with pomegranate peel extracts was extended the shelf life (Ghorbani et al., 2021).

The cookies and food bars can be consumed as additional food. In accordance with the Technical Guidelines for Supplementing the Indonesian Ministry of Health, that supplementation food for toddlers (6-59 months) per 40 g of product contains a minimum of 160 calories, 3.2-4.8 g of protein, and 4.0-7.2 g of fat. The school supplementation food per 36 g of product contains 144-216 calories, 3.96-5.76 g of protein, and 5.04-7.56 g of fat. The supplementation food for pregnant women per 60 g contains a minimum of 270 calories, a minimum of 6 g of protein, and a minimum of 12 g of fat. In addition, these three supplementation foods need

to be enriched with minerals such as iron, zinc and calcium.

Based on the results of other studies with the addition of catfish head and body flour each yielded 6.8% protein and 24.5 mg/ 100 gram calcium in gluten and casein free cookies with other main ingredients being rice flour, cornstarch, and tapioca (Nastiti & Christyaningsih, 2019). Another study developed an EFP in the form of instant sweet potato soup which contained of 6% water, 18% protein, 20.7% fat, and 30.5% yield (Sunyoto, Andoyo, & Dwiastuti, 2018).

Other researchers have developed emergency food cookies from only 2 ingredients, namely Mung bean flour and banana pulp with the best ratio of 20%: 80%. The product contain 40.62% water, 2.60% ash, 10.86% fat, 11.69% protein, and 36.53% carbohydrates (Nurhayati et al., 2018). The product still has a very high moisture content (40.62%) and has not yet been compared to the EFP requirements. The protein content in this study was also quite low and almost the same as the results of the EFP study of local flour variations.

Based on the experiences of earthquakes in Japan and Indonesia and the recommendations given to meet the nutritional needs of victims, the first priority is energy (Tsuboyama-Kasaoka & Purba, 2014). Then according to the emergency food requirements (Zoumas et al., 2002), therefore, the cookies and food bars have a nutritional content in

accordance with the requirements, as lowest as 233 Cal per 50 grams. The nutritional content of these EFPs can also be compared with the Nutrition Label Reference in Indonesia. The results of the study show that the nutritional content was in accordance with these various standards and requirements

The results of research conducted on women of childbearing age in post-earthquake areas in Wenchuan, China in 2009 showed that their micronutrient status was low. Based on the results of this study, researchers recommend the importance of improving the micronutrient status of women in disaster areas (Dong et al., 2014). Emergency food products produced from this research can be developed into ready-to-use supplementary food (RUSF) for malnourished toddlers. The iron (Fe) content for cookies and food bars were 2.89-3.85 and 2.63-3.59 mg per 50 g, respectively. The Zinc (Zn) content for cookies and food bars were 1.46-1.68 and 1.28-1.79 mg per 50 g. Calcium content for cookies and food bars were 190.40-195.05 and 215.84-231.06 mg per 50 g. Provision of RUSF supplementation

can improve the nutritional status of children aged 6-23 months in Nigeria. Increasing the nutritional status of children can reduce the risk of malnutrition, such as wasting, stunting, and mortality (Grellety et al., 2012).

Another research developing an emergency food product, a sagon from Indonesia local ingredient, Lindur, was result a high energy content that same with this research. A sagon from Lindur, another emergency food product, was consist of 251.5 kcal/bar of energy, 30 g of carbohydrates, 6.3 g of fat, 4.4 g of protein, and 4.03% water content (Afifah et al., 2022). The another research showed a emergency food bar from broccoli-soybean-mangrove significantly increased energy 291.9 kcal, carbohydrate 31.1 g, fat 15.6 g, and protein 6.1 g intake (Fatmah et al., 2021).

C. Organoleptic Properties of Emergency Food Products

The emergency food products were also tested organoleptically. Organoleptic tests on emergency food products involved 70 panelists. The organoleptic test results can be seen in Table 4.

Table 4. Organoleptic properties of emergency food products

Product	Organoleptic Value (Scale 1-7)*									
	$\bar{A} \pm SD^*$									
	Color		Flavor		Taste		Texture			
Cookies 1	5.2	\pm 1.3 ^a	5.3	\pm 1.3 ^a	5.4	\pm 1.2 ^a	5.8	\pm 1.1 ^a		
Cookies 2	5.6	\pm 1.0 ^b	5.3	\pm 1.2 ^a	5.4	\pm 1.2 ^a	5.6	\pm 1.0 ^b		
Foodbar 1	5.1	\pm 1.3 ^a	5.1	\pm 1.2 ^a	4.6	\pm 1.3 ^a	5.5	\pm 1.2 ^a		
Foodbar 2	5.3	\pm 1.2 ^a	5.3	\pm 1.1 ^a	5.3	\pm 1.3 ^b	5.6	\pm 1.1 ^a		

Note:

(Formula 1: Hanjeli flour, sweet potato flour, Garut bean flour, Tilapia fish flour; Formula 2: Corn flour, Cassava flour, Mung bean flour, Catfish flour)

*1 (very much disliked), 2 (much disliked), 3 (disliked), 4 (liked and did not like), 5 (liked), 6 (liked a lot), 7 (very much liked)

**Mean values with different superscripts within a column are significantly different ($p < .05$)

In general, the cookies and food bar as emergency food products were favored by panelists. The color, aroma, taste, and texture all these products were favored by panelists. In all cookies product parameters, the preference rating given were 5.2-5.8 (scale of 1-7). On all parameters of the Food Bar product, the preference rating given were 4.6-5.6 (scale of 1-7). That is, all products on all parameters tend to be favored with values over 4.5 on a scale of 1-7 (Meilgaard et al., 2016).

Statistically, the significant difference in value was only found in the color and texture parameters on cookies and taste parameters on the foodbar. That was, the combination of flour used in the two formulas resulted in more similar organoleptic acceptance. In general, from the parameters of color, aroma, texture, and taste, EFP from Indonesia local flour was the same as commercial cookies and food bar products on the market. The taste of the food product significantly affected the acceptance of consumers (Sumarto & Saragih, 2020).

Another study made cookies using local African peanut flour, namely apama and oraludi. The resulting organoleptic properties were between 3.07-8.29 on a scale of 1-9. The most preferred cookies in this study were still using wheat flour between 60-80% (Ayogu et al., 2016). In another cookies, added salaca Manonjaya flour, were 3.3-4.5 on scale

of 1-5 hedonic test (Sumarto, Aprianty, et al., 2018). In this study, emergency food products from Indonesia local flour were produced without the addition of wheat flour and produced cookies and foodbar that were acceptable to the panelists. The organoleptic value in Indonesian local flour EFP is more likely to be preferred and is above the median.

Other studies have made biscuits with fortified sources of fiber. After the biscuit was added, artichoke by-products were acceptable to the panelists and were the same as market products (San José et al., 2018). Cookies and foodbar EFP from Indonesia local flour were also suspected to have a high fiber content because the products made from seeds and nuts.

Another study has made biscuits by combining 3 raw materials, namely unripe cooking banana flour, pigeon pea flour, and sweet potato flour. The resulting biscuits have an acceptance rate that varies from 4.76 to 7.08 on a scale of 1-9 (Adeola & Ohizua, 2018). Cookies and foodbars, emergency food product from Indonesia local flour, that have been made in this study use a wider variety of raw materials, namely the addition of flour from freshwater fish (tilapia or catfish). So, apart from being organoleptic, emergency food products from Indonesia local flour were more acceptable, these emergency food products also contain higher nutrients, especially iron (Fe), zinc (Zn), and calcium (Ca).

CONCLUSION

The cookies and food bar emergency food products (EFPs) meet the EFP requirements, especially in the total calorie content. In addition, the EFPs have high levels of Iron, Zinc, and Calcium to meet the needs of the disaster victims, including vulnerable groups and stunted children. EFPs were favored by panelists on all parameters with a value above 4.5 (scale of 1-7). Both formulas A and B, Formula A consist of Hanjeli flour, Sweet Potato flour, Garut bean flour, and Tilapia fish flour; and Formula B consist of Corn flour, Cassava flour, Mung bean flour, and Catfish flour were meet the emergency food product requirement.

The products of this research can be recommended as an alternative to emergency food products, especially for buffer stock. In addition, EFPs can be developed as an alternative to supplementary food for groups with potential health problems (for example stunted children, pregnant women, and people with anemia) with local raw materials, especially in the Tasikmalaya region, West Java, Indonesia.

BIBLIOGRAFI

- Adeola, A. A., & Ohizua, E. R. (2018). Physical, chemical, and sensory properties of biscuits prepared from flour blends of unripe cooking banana, pigeon pea, and sweet potato. *Food Science and Nutrition*, 6(3), 532–540. <https://doi.org/10.1002/fsn3.590>
- Afifah, D. N., Pratama, Y., Ningrum, A., &

- Syahidah, T. (2022). Nutrient Content , Organoleptic Quality , and Shelf Life of Sagon Substitute From Lindur (*Bruguiera gymnorrhiza* L .) and Soybean Flour (*Glycine max* L .), as an Alternative Emergency Food. *Frontiers in Nutrition*, 9(September 2020), 1–11. <https://doi.org/10.3389/fnut.2022.878539>
- Ainehvand, S., Raeissi, P., Ravaghi, H., & Maleki, M. (2019). The characteristic features of emergency food in national level natural disaster response programs : A qualitative study. *Journal of Education and Health Promotion*, 8(March), 1–8. <https://doi.org/10.4103/jehp.jehp>
- Aini, N., Prihananto, V., Wijonarko, G., Sustriawan, B., Dinayati, M., & Aprianti, F. (2018). Formulation and characterization of emergency food based on instan corn flour supplemented by instan tempeh (or soybean) flour. *International Food Research Journal*, 25(1), 287–292.
- Anandito, R. B. K., Siswanti, Nurhartadi, E., & Hapsari, R. (2016). Formulasi Pangan Darurat Berbentuk Food Bars Berbasis Tepung Millet Putih (*Panicum milliaceum* L.) dan Tepung Kacang Merah (*Phaseolus vulgaris* L.). *Agritech*, 36(1), 23–29.
- AOAC 2001.11. (2001). *Official Method of Analysis Protein (Crude) in Animal Feed, Forage (Plant Tissue), Grain, and Oilseeds Block Digestion Method Using Copper Catalyst and Steam Distillation into Boric Acid First Action*. Association of Official Analytical Chemists.
- AOAC 925.40. (1925). *Official Method of Analysis Moisture in Nuts and Nut Products First Action*. Association of Official Analytical Chemists.
- AOAC 948.22. (1948). *Official Method of Analysis Fat (Crude) in Nuts and Nut Products Gravimetric Methods First Action*. Association of Official Analytical Chemists.
- AOAC 950.49. (1950). *Official Method of Analysis Ash of Nuts and Nut Products Gravimetric Method First Action*. Association of Official Analytical Chemists.
- Arimond, M., & Ruel, M. (2004). Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys. *The Journal of Nutrition*, 134, 2579–2585.
- Ayogu, R. N. B., Nnam, N. M., & Mbah, M. (2016). Evaluation of two local cowpea species for nutrient, antinutrient, and phytochemical compositions and organoleptic attributes of their wheat-based cookies. *Food and Nutrition Research*, 60. <https://doi.org/10.3402/fnr.v60.29600>
- Badan Penelitian dan Pengembangan Kesehatan. (2018). Main Results of Basic Health Research (In Bahasa, Hasil Utama Riset Kesehatan Dasar (RISKESDAS)) 2018. In *Basic Health Research 2018*.
- BNPB, [Badan Nasional Penanggulangan Bencana]. (2019). *Data dan Informasi Bencana Indonesia*. DIBI BNPB.
- Brown, K., Dewey, K., & Allen, L. (1998). *Complementary feeding of young children in developing countries: a review of current scientific knowledge*. WHO.
- BSN. (1992). Analysis of Food (Cara Uji Makanan dan Minuman) - SNI 01-2891-1992. In *Indonesian National Standard* (p. Jakarta (ID): BSN). Badan Standardisasi Nasional.
- BSN. (2011). *SNI 2973:2011 Biskuit (Cookies)* (2973:2011). Badan Standardisasi Nasional.

- Devi, R. (2015). Food Processing and Impact on Nutrition. *Scholars Journal of Agriculture and Veterinary Science*, 2(4A), 304–311.
- Direktur Gizi Masyarakat Kemenkes RI. (2018). *Buku saku Pemantauan Status Gizi Tahun 2017*. Kementerian Kesehatan RI.
- Dirjenkesmas, [Direktorat Jenderal Kesehatan Masyarakat]. (2017). *Petunjuk Teknis Pemberian Makanan Tambahan (Balita - Ibu Hamil - Anak Sekolah)*. Kementerian Kesehatan RI.
- Ditjen Kesmas Kemenkes RI. (2018). *Pedoman Penanganan Gizi dalam Penanggulangan Bencana*. Kementerian Kesehatan RI.
- Dong, C., Ge, P., Ren, X., Zhao, X., Fan, H., Yin, S. A., & Weiderpass, E. (2014). Evaluating the micronutrient status of women of child-bearing age living in the rural disaster areas one year after Wenchuan Earthquake. *Asia Pacific Journal of Clinical Nutrition*, 23(4), 671–677. <https://doi.org/10.6133/apjcn.2014.23.4.22>
- Ekafitri, R., & Faradilla, R. (2011). Pemanfaatan Komoditas Lokal sebagai Bahan Baku Pangan Darurat. *Pangan*, 20(2), 153–161.
- Farajzadeh, D., & Golmakani, M. T. (2011). Formulation and experimental production of energy bar and evaluating its shelf-life and qualitative properties. *Iranian Journal of Military Medicine*, 13(3).
- Fatmah, F., Utomo, S. W., & Lestari, F. (2021). Broccoli-Soybean-Mangrove Food Bar as an Emergency Food for Older People during Natural Disaster. *International Journal of Environmental Research and Public Health*, 18(3686), 1–14.
- Ferraz De Arruda, L., Borghesi, R., Brum, A., Regitano D'Arce, M., & Oetterer, M. (2006). Nutritional aspects of Nile tilapia (*Oreochromis niloticus*) silage. *Ciencia e Tecnologia de Alimentos*, 26(4), 749–753. <https://doi.org/10.1590/s0101-20612006000400006>
- Ghorbani, E., Moghaddam, A. D., Sharifan, A., & Kiani, H. (2021). Emergency Food Product Packaging by Pectin-Based Antimicrobial Coatings Functionalized by Pomegranate Peel Extracts. *Journal of Food Quality*, 2021, 1–10.
- Grellety, E., Shepherd, S., Roederer, T., Manzo, M. L., Doyon, S., Ategbo, E. A., & Grais, R. F. (2012). Effect of Mass Supplementation with Ready-to-Use Supplementary Food during an Anticipated Nutritional Emergency. *PLoS ONE*, 7(9), 1–9. <https://doi.org/10.1371/journal.pone.0044549>
- Hadi, V., Norouzy, A., Mazaheri Tehrani, M., Nematy, M., & Hadi, S. (2018). Properties of Compact Food Bars: A Review Study. *Journal of Nutrition, Fasting and Health*, 6(3), 125–131. <https://doi.org/10.22038/JNFH.2018>.
- Hermayanti, M. E., Rahmah, N. L., & Wijana, S. (2016). Formulasi Biskuit Sebagai Produk Alternatif Pangan Darurat. *Jurnal Teknologi Dan Manajemen Agro Industri*, 5(2), 107–113.
- Hikmahwidi, R. (2018). Penentuan Komoditas Unggulan Tanaman Pangan dan Ternak Ruminansia Di Kabupaten Tasikmalaya. *Jurnal Pemikiran Masyarakat Ilmiah Berwawasan Agribisnis*, 4(1), 98–110.
- Kusumastuty, I., Fandianty Ningsih, L., & Rio Julia, A. (2015). Formulasi Food Bar Tepung Bekatul dan Tepung Jagung

- sebagai Pangan Darurat (Formulation of Rice Bran Flour and Corn Flour as Emergency Food Product). *Indonesian Journal of Human Nutrition*, 2(2), 68–75.
- Meilgaard, M. C., Civille, G. V., & Carr, B. T. (2016). Sensory evaluation techniques 5th edition. In *CRC Press* (5th editio). CRC Press. <https://doi.org/10.1111/j.1471-0307.2007.00330.x>
- Mervina. (2009). *Formulasi biskuit dengan substitusi tepung ikan lele dumbo (Claris gariepinus) dan isolat protein kedelai (Glycine max) sebagai makanan potensial untuk anak balita gizi kurang*. Institut Pertanian Bogor.
- Mitra, T., Ganguly, S., Banerjee, S., Mahanty, A., Raman, R. K., Bhowmick, S., & Mohanty, B. P. (2017). Nutritional composition of different size groups of catfish Rita rita (Hamilton, 1822) from river Ganga. *Indian Journal of Fisheries*, 64(76205), 68–74. <https://doi.org/10.21077/ijf.2017.64.special-issue.76205-10>
- Mohebi, S., Parham, M., Sharifirad, G., & Gharlipour, Z. (2019). The characteristic features of emergency food in national level natural disaster response programs: A qualitative study. *Journal of Education and Health Promotion*, 8, 1–6. <https://doi.org/10.4103/jehp.jehp>
- Nastiti, A. N., & Christyaningsih, J. (2019). Pengaruh substitusi tepung ikan lele terhadap pembuatan cookies bebas gluten dan kasein sebagai alternatif jajanan anak autism spectrum disorder. *Media Gizi Indonesia*, 14(1), 35–43.
- Nurhayati, Maryanto, & Gandaningrum, L. (2018). Sensory and Chemical Characteristics of Bar Cookies Made from Mung Bean Flour and Ripe Plantain var Raja as Emergency Food. *Pertanika Journal of Tropical Agricultural Science*, 41(3), 1413–1422.
- San José, F. J., Collado-Fernández, M., & López, R. (2018). Sensory evaluation of biscuits enriched with artichoke fiber-rich powders (*Cynara scolymus* L.). *Food Science and Nutrition*, 6(1), 160–167. <https://doi.org/10.1002/fsn3.541>
- Sanin, K. I., Islam, M. M., Mahfuz, M., Ahmed, A. M. S., Mondal, D., Haque, R., & Ahmed, T. (2018). Micronutrient adequacy is poor , but not associated with stunting between 12-24 months of age : A cohort study findings from a slum area of Bangladesh. *PLoS One*, March 29, 1–18. <https://doi.org/10.1371/journal.pone.0195072>
- SIG. (2019). *18-13-1/MU/SMM-SIG (ICP OES) - Method of Food Analysis*. Saraswanti Indo Genetech Ltd. https://doi.org/10.1007/978-3-658-21949-9_5
- Sumarto, Aprianty, D., Bachtiar, R. A., & Kristiana, L. (2018). Organoleptic characteristics and nutritive value estimation of baked food products from Manonjaya variety salacca flour. *International Symposium on Food and Agro-Biodiversity*, 1–7.
- Sumarto, Listianasari, Y., Radiati, A., & Nugraha, A. G. (2018). *Panduan Teknis Penyelenggaraan Makanan dalam Kondisi Darurat Bencana dengan Pemanfaatan Sumber Daya Lokal (Studi Kasus Di Kabupaten Tasikmalaya)*. Poltekkes Kemenkes Tasikmalaya.
- Sumarto, & Saragih, M. (2020). Does the Taste and Appearance of Food Affect Food Waste in Low-Salt Diet Patients ? *J Nutr Sci Vitaminol*, 66, 56–62.

Sumarto, & Tajrifani, A. S. (2020). Pengembangan Produk Pangan dari Bahan Baku Lokal untuk Buffer Stock Darurat Bencana di Kabupaten Tasikmalaya, Jawa Barat. *Jurnal Dialog Penanggulangan Bencana*, 11(2), 179–185.

Tsuboyama-Kasaoka, N., & Purba, M. B. (2014). Nutrition and earthquakes: experience and recommendations. *Asia Pacific Journal of Clinical Nutrition*, 23(4), 505–513. <https://doi.org/10.6133/apjcn>

Zahra, S. M., Nadeem, M., Hussain, S., Qureshi, T. M., Din, A., & Rashid, F. (2014). Development and Evaluation of Nutri-Bars for Internally Displaced People in Humanitarian Emergencies. *J. Agric. Res.*, 52(2), 217–227.

Zoumas, B. L., Armstrong, L. E., Backstrand, J. R., Chenoweth, W. L., Chinachoti, P., Klein, B. P., Lane, H. W., Marsh, K. S., & Tolvanen, M. (2002). *High-energy, Nutrient-dense Emergency Relief Food Product*. National Academy Press.

Copyright holder:

Sumarto, Ani Radiati, Deris Aprianty, Irma Nuraeni, Ima Karimah (2023)

First publication right:

Asian Journal of Engineering, Social and Health (AJESH)

This article is licensed under:

