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The Potential of Local Tubers as Nutritious Instant Food

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Abstract
This literature study aims to find out and explore the potential of local tubers as nutritious instant food. Instant food is food that is packaged, easy to prepare, practical, or treated only. The food is generally produced by the food processing industry with high technology and provides a variety of additives to preserve and provide flavor to the product. Nowadays people's consumption patterns are required to be fast-paced due to increasingly dynamic work, so instant food is the solution, but not all instant foods are good for health. Tubers are one of the commodities that have the potential to be developed as instant food, in addition to being a substitute for rice to support food diversification programs. Food diversification is a way to organize or create a diversity of commodities consumed, with the program of diversification of food, it is expected that people's consumption patterns not only depend on one type of food but also have other alternatives.

***Keyword**: Instant Food, Tubers, Food Diversification*.

1. Introduction

People's lifestyle habits in consuming food products are influenced by a lifestyle that has become more dynamic by the demands of work or customers are getting higher [1]. In this modern life, urban communities are required to live a fast-paced and instant consumption lifestyle. This is due to the dense activities and activities outside the home carried out by the family [2]. In general, the composition of fast food contains higher energy, salt, and fat including cholesterol and contains only a little fiber [3].

Based on the results of a survey conducted by Nilsen in 2008 [4], data was obtained that 69% of urban communities in Indonesia consume fast food, with the following details: as many as 33% declared as lunch, 25% dinner, 9% declared interspersed food and 2% chose to eat breakfast. Research conducted by Heryanti in 2009, with the title "fast-food eating habits, physical activity and other factors with nutritional status", obtained the highest level of fast-food consumption in the student group of (83.3%).

In national development, the food agriculture sector occupies an important priority. This situation is reflected in various forms of interventions made by the government in the food sector, especially rice, such as government investment in the agricultural sector and water research and development of agricultural technology and price policy [5]. Rice is a strategic food commodity that needs to be guaranteed availability because it can affect economic conditions and national development and requires intervention from the government [6].

From the consumption aspect, the understanding that rice consumption is an indicator of advanced society causes changes in food consumption habits and dependence on rice. Even the change in habits imposed from non-rice staple foods to rice led to dependence on rice food which is not supported by the ability of the region in providing its food production. This causes the burden of self-help rice to become increasingly heavy [7].

2. Materials and Methods

The method used in the writing of this scientific work is the study of literature. Briefly, Fraenkel, Wallen, &Hyun [8] suggests literature studies are a literature study that supports specific problems in the research we are working on. This study is very useful for researchers, for example, to provide an overview of the problem to be researched, provide conceptual theoretical support for researchers, and further use for discussion materials or discussions in research.

The collection of these articles was done with the help of the Google Scholar (GS) database, Neliti, Jurnal Garuda, and Research Gate. Search results on some of these databases generate some articles that are relevant to the topic. The articles are then selected which are following the discussion to be conducted and grouped based on the content of study in each article [9].

3. Results and Discussion

3.1. Potential of Local Tubers as a Substitute for Rice

Tubers are one of the local potentials that need to be developed and have various advantages, including having a high content of nutrients and carbohydrates as a food source, can grow in marginal areas where other plants cannot grow and can be stored in the form of starch [10]. The shift in people's consumption patterns from rice to wheat flour in the form of instant noodles, and bread, shows the public's attention to foodstuffs derived from tubers is still lacking [11]. Limited consumption of tubers due to the assumption that the majority of the population in this food group is village food, not elite, outdated, poor, and unqualified food [12]. One of the largest food commodities in Indonesia is tubers [13].

Table 1. Data on Production of Cassava, Sweet Potatoes, and Potatoes in Indonesia in 2014-2018 [13]

Commodity	Year of Production				
	2014	2015	2016	2017	2018
Cassava (Ton)	23,436,384	21,801,415	20,260,675	19,053,748	19,341,233
Sweet Potato (Ton)	2,382,658	2,297,634	2,169,386	2,029,353	1,914,244
Potatoes (Tons)	1.219.270	1,213,038	1,164,738	1,284,760	1,314,657

Based on data from the *Badan Pusat Statistik* (BPS) [13], cassava production in Indonesia decreased from 23.4 million tons in 2014, to 19.3 million tons in 2018, as well as sweet potatoes which in 2014 as much as 2.3 million tons decreased to 1.9 million tons in 2018 and potato production was stable until 2018 increased to 1.3 million tons.

Table 2. Comparative Data on Consumption of Tubers and Rice in Indonesia in 2015-2019 [14].

Commodity	Consumption (kg/capita/year)				
	2015	2016	2017	2018	2019
Cassava	6.5	7.4	12.4	9.5	8.6
Sweet Potato	3.6	4.2	4.3	3.4	3.5
Potato	2.4	2.9	2.6	2.4	2.9
Rice	96.9	99.1	95.4	97.1	94.9

Based on data from the Food Security Agency [14], the consumption of tubers especially cassava, sweet potatoes, and potatoes is very minimal when compared to rice. Cassava consumption in Indonesia in 2019 was only 8.6 kg/capita/year, while sweet potatoes amounted to, 3.5 kg/capita/year in 2019, as well as potatoes that only consumed 2.9 kg/capita/year in 2019 compared to rice consumption of 94.9 kg/capita/year in 2019.

3.1.1. Cassava

Most of the components of cassava are carbohydrates, this causes cassava to be called a substitute for rice because it has almost the same benefits as energy sources. According to Salim [15] cassava has a content of compounds that are beneficial to the body when viewed from its

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chemical components, but cassava also has glucoside compounds that are toxic and form cyanide acid.

HCN can be eliminated by several processes, such as fermentation, heating, boiling (discarded boiling water), soaking/washing (discarded laundry water), frying, drying, and steaming. The chemical composition of cassava can be seen in Table 3.

Table 3. Chemical composition of cassava per 100g [15]

Nutritional Content	Composition
Calorie	0,061 kcal
Water	62.5 g
Protein	1.2 g
Carbohydrates	34 g
Fat	0.3 g
Phosphorus	40 mg
Iron	0.7 mg
Vitamin C	30 mg
Vitamin B1	0,06 mg
Calcium	33 mg

3.1.2 Sweet potatoes

The sweet potato plant (Ipomoea batatas. L) is thought to have originated in the Americas. Botanists and agriculture estimate the areas of origin of sweet potato plants are New Zealand, Polynesia, and central America.

Sweet potatoes contain a variety of different ingredients in each color. According to Rukmana, [16] sweet potato colors are as diverse as white, purple, red, yellow, or orange. Yellow mesh tubers are rich in beta carotene (provitamin A) and vitamin C. Purple tubers are also an excellent source of vitamin C and beta carotene (provitamin A).

Table 4. Nutritional Content of Sweet Potatoes per 100g [17]

Nutritional Content	Composition
Calorie	123,00 Kal
Water	68.5 g
Protein	1.8 g
Carbohydrates	27.9 g
Fat	0.7 g
Phosphorus	49 mg
Iron	0.7 mg
Vitamin C	22 mg
Vitamin B1	0.9 mg

3.1.3 Potatoes

Potato tubers contain various components of nutrients that are needed for the health of the body. According to Godam [18], the nutritional value of potatoes per 100 g is as follows.

Table 5. Nutritional Content of Potatoes per 100g

No.	Nutritional Content	Composition
1.	Energy (cal)	83
2.	Carbohydrates (g)	19
3.	Starch(g)	15
4.	Protein (g)	2
5.	Fat (g)	0,1
6.	Dietary Fiber (g)	2.2
7.	Water (g)	75
8.	Vitamin B1(mg)	0.08

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9.	Vitamin C (mg)	20
10.	Calcium (mg)	12
11.	Iron (mg)	1.8
12.	Fosfor (mg)	57

The amino acid content of potato tubers is also balanced which means that potatoes contain amino acids so it is very good for health [19]. Amino acids found in potatoes are leucine, phenylalanine, lysine, valine, arginine, tryptophan, threonine, histidine, cysteine, and methionine. Essential amino acids are leucine, phenylalanine, lysine, valine, and arginine. Potato tubers contain little fat and cholesterol but contain much higher carbohydrates, sodium, dietary fiber, protein, vitamin C, calcium, iron, and vitamin B6 which are quite high [20].

3.2. Benefits of Tubers for Health

Sweet potato (*Ipomoea Batatas*) is a type of tuber that have many advantages over other tubers, including carbohydrates and high energy that can restore energy quickly, as well as some substances that are very important for the body, such as vitamins, minerals, fiber, and anthocyanins, especially in the type of red and purple yams that serve as antioxidants [21]. Anthocyanins in purple sweet potatoes also have physiological functions as anti-cancer, anti-bacterial protection against liver damage, heart disease, and stroke [22].

The advantages of cassava as a functional food can be seen from (1) macronutrient levels (except protein) and micro high, so that the number of people with anemia and vitamin A and C deficiency in the community whose basic food cassava is relatively few; (2) glycemic levels in the blood are low; (3) high levels of soluble dietary fiber, in the intestines and stomach, have the potential to become probiotics [23].

The amino acid content of potato tubers is also balanced which means that potatoes contain amino acids so it is very good for health [19]. Potatoes are commonly used for treatment inside and outside the body. Indications of potato used for the body are for health, obesity, diabetes, gastritis, constipation. Indications of the use of raw potatoes for the outside of the body are burns, open leg wounds, cracks. [24].

Table 6. Comparison of Nutrition Content of Local Tubers with Rice [15, 17, 18]

No	Nutrition Content	Potatoes	Cassava	Sweet Potato	Rice
1.	Water (g)	75	62.5	68.5	12
3.	Protein (g)	2	1.2	1.8	8.4
4.	Fat (g)	0.1	0.3	0.7	1.7
5.	Carbohydrates (g)	19	34	27.9	77,1
6.	Calories (cal)	83	61	123	357

3.3. Potential of Local Tubers as Instant Food Through Drying Freeze-Drying Method

Drying food has two main objectives, namely as a means of extending shelf life by reducing the food moisture content to prevent the growth of decaying microorganisms and minimizing the distribution of foodstuffs due to the lower weight and size of food. The heat will be transferred to the foodstuffs and the mass of water will be evaporated from the foodstuffs so that dry or instant food will be obtained [25].

The advantages of frozen drying products include a structure that does not shrink, allowing very fast rehydration, high flavor retention because drying takes place at low temperatures, and the life force and reconstitution of living cells in dry-frozen products remains high. Frozen drying is well known in the process of lyophilization (lyophilization) products [26].

Instant food products are attempted not to occur case-hardening that does not occur the process of gelatinization of starch, caramelization, and denaturation of proteins. To maintain the texture and shape of the product can use freeze-drying (freeze dryer) with vacuum drying [27]. As the name implies freeze-drying, the moisture content in the product will first be converted into ice which then the ice will be sublimated at temperature and pressure below triple point in the water phase diagram. Determining the mass under vacuum conditions is not easy to do. The

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operating limit conditions of some sensors and their size can also be affected by some disturbances, such as vibration, gas flow, and temperature gradient [28].

In freeze-drying, products are first frozen and then dehydrated by sublimation of the ice formed during freezing (primary drying) and desorption of the unfrozen water (secondary drying) [29]. The freeze-drying process mainly consists of the following three stages [30]:

- Freezing. The product is frozen in controlled conditions to avoid possible damage, by crystal growth, to the food or biological material. Our model does not include this stage. The product temperature is assumed to be uniform at the end of the freezing stage, and it is used as the initial temperature for the primary drying.
- Primary drying. In this stage, ice is removed from the product by sublimation. Pressure conditions are kept below the triple point and the product is heated from the bottom. An excessive temperature increase in this stage will cause the product to collapse so it must be kept below a given value, see Section 2.2.4 for details.
- Secondary drying. The aim is to remove water bound to the solid matrix by desorption. This stage allows for reaching low moisture contents. The food product is more stable during secondary drying so its temperature may be increased to accelerate the process.

Freeze-drying operates at low temperatures, which contributes to preserve characteristics such as taste, color, or appearance and to minimize the degradation of thermolabile compounds, many of them responsible for the aromas and nutritional value of the fruits, Thus, the final freeze-dried product is high quality as compared with other techniques of dehydration [31]. Isti Pudjihastuti [28] in his study entitled "Tomato Fruit Preservation Technology with Freeze-Drying Method" explained that there is no significant decrease in nutrition in drying tomatoes using the freeze-drying method. The nutritional content of freeze-drying dried tomatoes can be seen in Table 7.

Table 7. Chemical Content of Tomato Fruit, before and after drying with freeze-drying method [28]

Nutrition Content	Raw Material	Freeze Drying
Moisture Content (%)	93.4	9
Protein (g/100g)	7.2	6.3
Fat (g/100g)	2.1	1.7
Calcium (mg/100g)	79.3	69.3
Phosphorus(mg/100g)	134.1	123.5
Magnesium (mg/100g)	122.2	114.6
Vitamin C (mg/100g)	135	118.3
Vitamin B2 (mg/100g)	0.64	0.31
Vitamin B6 (mg/100g)	0.98	0.71

4. Conclusion

Local tubers have the potential as a substitute for rice because it has a nutritional content that is not much different from rice. So that with the program of food diversification and processing of local tubers into instant food is expected to make public consumption of tubers increase.

Tubers have a variety of benefits for the health of sweet potatoes have a lot of nutrients and contain antioxidants (anthocyanins) that have physiological functions as anti-cancer, anti-bacterial protection against liver damage, heart disease, and stroke. While cassava has a low glycemic content and has a lot of food fiber content so that it has the potential as a probiotic. Similarly, potatoes that have a variety of health benefits such as potatoes are commonly used for treatment inside and outside the body. Indications of the use of potatoes for the body are for health, obesity, diabetes, gastritis, constipation.

Freeze-drying is the most appropriate drying method because freeze-drying does not make the nutritional content of food significantly reduced. The concept of freeze-drying is In freeze-

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drying, products are first frozen and then dehydrated by sublimation of the ice formed during freezing (primary drying) and desorption of the unfrozen water (secondary drying).

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