

# Analysis of Design Product Entrepreneursip Syrup Based Purple Sweet Potato (*Ipomoea batatas*)

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## Abstract

**The purpose of the research** is the analysis of design product entrepreneursip syrup based purple sweet potato (*ipomoea batatas*). **The method used** experimental research (natural setting) with data collection techniques in the form of observation. **The results showed:** 1) Purple sweet potato is one of the food commodities that has the advantage of functional properties, because it contains antioxidants, vitamins and minerals needed by the body; 2) Purple sweet potato in Indonesia has not been fully utilized; 3) To increase the diversification of food for purple yams, it can be processed into syrup so that it is more practical, easy to consume and very beneficial for the body; 4) Syrup is a type of soft drink in the form of a thick solution with various tastes; 5) Packaging is a process of wrapping, storing or packing a product using certain materials so that the products in it can be accommodated and protected; 6) While the product packaging is the packaging part of a product that is in it; 7) This packaging is one way to preserve or extend the life of food products or food contained in it; 8) Syrup based purple sweet potato is an alternative design product in entrepreneurship higher education.

## Keywords

Purple\_Sweet\_Potato 1, Syrup\_Processing2, Design\_Product\_Entrepreneursip3, Alternative\_Food\_Industry4, and Entrepreneurship\_High\_Education5

## 1. Introduction

Sweet potato (*Ipomoea Batatas, L*) or by other names sweet potato is an important food crop, ranked seventh on the list of the most important food crops in the world. Sweet potato is a plant that is widely cultivated in Indonesia. The area of sweet potato cultivation centers spread from northern Sumatra Island to Papua. In 2013, sweet potato productivity in Indonesia reached 142.27 ku / ha with annual production reaching 2,366,410 tons (Suismono. 1995; Cahyono and Juanda. 2000; Irawan and Wawan. 2006).

Sweet potato is a plant that is very familiar to Indonesians, found in many markets at relatively cheap prices. There are several types of sweet potatoes, the most common types of which are white, red, purple, yellow or orange sweet potatoes. Other nutrients in sweet potatoes are energy, vitamin C, vitamin B6 (pyridoxine) which plays an important role in the body's immunity. The mineral content in sweet potatoes such as phosphorus, calcium, manganese, iron and soluble fiber to absorb excess fat / cholesterol in the blood.

Sweet potato or sweet potato (*Ipomoea batatas*) is a type of cultivated plant. The part that is used is the roots that form tubers with a high source of carbohydrates and calories. Purple sweet potato is one of the food crops that can grow and develop in Indonesia, as the fourth highest source of non-rice carbohydrates after rice, corn, and cassava. Purple-based foods in ancient times were better known as poor food substitutes for rice. The purple cassava is only boiled and fried. But now they are able to disguise the food made from purple sweet potato into a classy and quality food.



Figure 1. Purple Sweet Potato

Syrup is an oral solution that contains high levels of sucrose or sugar. Syrup can be made from the basic ingredients of fruit, leaves, seeds, roots and other parts of the plant. Syrup is not only to eliminate thirst and fulfill the fluid needs of the human body, some types of syrup can benefit the antioxidants needed by the body as an antidote to free radicals (Astawan and Kasih, 2008; Jiang, 2001; Kano, et al. 2005).

Making syrup by utilizing basic ingredients from nature that are easily available to the community as natural antioxidants is urgently needed, this aims to provide an understanding of the importance of antioxidants. One of the basic ingredients that is easily available is purple sweet potato.

#### **Problem Formulation**

What is the technology for making purple sweet potato syrup that can be used as a diversification of food in terms of tubers, anthocyanin levels and also purple sweet potato starch?

#### **Purpose**

To create food diversification, especially for products from purple sweet potatoes.

## **2. Research Methods**

The method used is qualitative action research with data collection techniques in the form of observation, interviews and documentation, after the data collected is then analyzed by stages of reduction, display and verification. Observations cover various aspects of developing the purple sweet potato syrup based food industry, the stages of university entrepreneurship education. and advanced statistical analysis (Grundy, 1995; Kemmis and Taggart, 1997; Taggart, et al. 1997).

## **3. Result and Discussion**

### *3.1 Product Analysis*

Indonesia has abundant potential and natural resources, various sciences are developed to optimize available resources, especially in the field of food processing. Many new technologies are found with the aim of diversifying food and preserving food, and making it easier for consumers to benefit from food.

Tabel 1. Nutritional Content per 100 g Purple Sweet Potato

| Type        | Purple Sweet Potato |
|-------------|---------------------|
| Calori      | 123 kkal            |
| Carbohidrat | 12,64%              |
| Sugar       | 0,30%               |
| Fat         | 0,94%               |
| Protein     | 0,77%               |

|             |                      |
|-------------|----------------------|
| Water       | 70,46%               |
| Ash         | 0,84%                |
| Fiber       | 3 %                  |
| Betacaroten | 9.900 mkg (32967 SI) |
| Vitamin C   | 21,34 mg/100 g       |
| Antosianin  | 110,51 mg/100 g      |
| Vitamin A   | 7.700 mg             |

Source : Ministry of Health RI, 1996.

One of the impacts of the development of food processing technology is the diversification of agricultural products, including beverage products. Many packaging drinks are produced by large-scale household and industrial industries. Generally, beverage products or fruit extracts use bottled bottles. The basic ingredients of the bottles used also vary from bottles made from plastic or glass-based bottles.

The packaging of purple sweet potato syrup generally uses glass bottles to minimize damage caused during distribution. Glass containers continue to grow today, from simple vessels to very interesting shapes. The advantages of glass-based packaging are waterproof, gas and microorganisms, while the disadvantages are heavy loads so that transportation costs are expensive, resistance to rupture, dimensions vary and potentially cause danger, namely from broken glass.

### *3.2 Technology For Making Purple Sweet Potato Syrup*

The raw material for making syrup is fresh purple sweet potato. Purple sweet potatoes are easily available anywhere. Purple sweet potato is widely traded in traditional markets at relatively cheap prices. Fresh purple sweet potato can also be used to be processed into various innovative processed food products. The use of purple sweet potato in fresh form is easier and faster than using it in the form of flour. But the basic ingredients in the form of fresh tubers do not have a long shelf life, whereas in the form of flour can be stored longer.

The production process is done by using 210 kg of sweet potato in one production. In its production it takes 8 kinds of machines and equipment needed, including washing machines, large knives, cutter machines, scales, boiling tanks, mixers, cooking tanks and packing machines using glass bottles. By using these machines and equipment, 700 bottles can be produced in one production.

The production process will be carried out 2 times within 1 day, so that it occurs in 2 shifts. So the purple sweet potato needed is 257 kg, 249.6 liters of water and additives (sugar, cornstarch and citric acid) are 242.4 kg in one day to produce 210 liters of purple sweet potato syrup or 210,000 ml . This purple sweet potato syrup will be packaged in glass bottles weighing as much as 300 gr. So that in one production time it can produce 700 bottles per day. In the process of producing purple sweet potato syrup several stages are carried out until the packaging stage (Devianti, 2013; Bauman and Sessa, 2016).

### *3.3 Routing Sheet Purple Sweet Potato Syrup*

Making a map of the operating process requires a main document known as the Master Route Sheet or Routing Sheet. Routing Sheet is the initial stage that must be done before the production activity starts from identifying or determining the sequence of machines or equipment, production processes and operations that are in accordance with the needs and efficiency. This routing sheet is very important for production supervision because it aims to determine the quality of the product to be made and the length of time it takes to work on each of the activities of the product (Sun, et al. 2014).

In general, in addition to presenting the sequence of machines or equipment and production processes, routing sheets usually also include, among others, engine capacity,% of scrap produced and the amount of material / machine / equipment requirements. So that for the purposes of calculating the needs of materials, machines or equipment, this routing sheet can be used. The things that must be considered before making routing sheets are as follows:

- a. Material / material used to produce a product.
- b. The number of units of product to be made.
- c. Sequences of activities that are of a fixed nature.
- d. Equipment used to carry out work.
- e. Components for assembling after production.

### *3.3 Marketing Purple Sweet Potato*

Processing of purple sweet potato into processed products was introduced through extension activities to farmer groups. Marketing is the main key to running a business so that it makes it easier for producers to form market

segments, branding concepts, sales locations, concepts and sales mechanisms, the size and type of packaging is very vital to do at the beginning. SWOT analysis (Strength, Weakness, Opportunity, Threat) needs to be done as a consideration and determine the strategy to be taken.

The marketing strategy taken is to sell purple sweet potato syrup ready to drink in packs with attractive packaging designs not only for adults but also children. The thing that is highlighted in the product is not using artificial dyes because in the raw material there is a deep purple anthocyanin substance. The use of real sugar and no preservatives is also highlighted in order to get more attention from consumers. Sales are carried out at purple sweet potato tourism sites both manually and social media.

### *3.4 Industrial Waste Management*

The advantages of the production of purple sweet potato syrup often cause problems for the environment because not all of the crops are sold out. Meanwhile, waste management is a complex problem. The progress of science and technology can be used to overcome the problem of garbage. The company PT Victory Food Indonesia will handle production waste well and not damage the surrounding environment. Purple sweet potato is used as the main ingredient in making syrup so that it still pays attention to the remaining waste (Zhang, et al. 2015).

### *3.5 Solid Waste*

Solid waste is waste in the form of solid objects or parts of material that are no longer used in a process. Handling of waste must also be considered so as not to pollute the surrounding environment and not contaminate other materials used as industrial raw materials. Skin and sweet potato waste is one example of solid waste that is in the process of making syrup. The way to avoid polluting is to make the material as the animal feed industry. Solid waste can be destroyed and resold to third parties or processed into new processed products so that they continue to pay attention to the selling value.

### *3.6 Liquid waste*

Liquid waste is liquid waste. Handling of liquid waste must be considered so as not to pollute the environment around the factory. Liquid waste in the industrial process of syrup is dirty laundry water. One of the things that must be done is to water the plants in the company garden so that the creation of beauty that is environmentally friendly. Water that is not so dirty can be done to wash equipment in industrial processes (Miyazaki, et al. 2008).

### *3.7 Packaging Process Function*

In terms of daily packaging, it is often intended as a wrapper using plastic, paper, aluminum foil, various types of leaves, midribs, animal skins, and so on. The scope of packaging is actually even wider, not just packaging but also includes storage, bottling, canning, packing, encapsulation, and coating (Gupta and Kamalinder, 2007). There are 6 main functions of packaging that should be met by a packaging material, namely:

1. Keep food or agricultural products clean protected from dirt.
2. Protect food from physical damage, changes in water content and radiation.
3. Has the ease of opening and closing, and also facilitate distribution.
4. Displays identification, information, attractiveness, and appearance clear so that it can help promotion.

### *3.8 Packaging of Purple Sweet Potato Syrup*

Indonesia has abundant potential and natural resources, various sciences are developed to optimize available resources, especially in the field of food processing. Many new technologies are found with the aim of diversifying food and preserving food, and making it easier for consumers to benefit from food (Saputra et al. 2018).

One of the impacts of the development of food processing technology is the diversification of agricultural products, including beverage products. Many packaging drinks are produced by large-scale household and industrial industries. Generally, beverage products or fruit extracts use bottled bottles. The basic ingredients of the bottles used also vary from bottles made from plastic or glass-based bottles.

The packaging of purple sweet potato syrup generally uses glass bottles to minimize damage caused during distribution. Glass containers continue to grow today, from simple vessels to very interesting shapes. The advantages of glass-based packaging are waterproof, gas and microorganisms, while the disadvantages are heavy loads so that transportation costs are expensive, resistance to rupture, dimensions vary and potentially cause danger, namely from broken glass.

### 3.9 Packaging Recommendation Purple Sweet Potato Syrup



Figure 2. Primer Packaging

The primary packaging is called because the packaging is directly in contact with the product. Examples of primary packaging are glass bottles, tubes and caps. Purple sweet syrup uses label paper and glass bottles because the primary packaging is not in direct contact with the product. Primary packaging is very important in terms of its function, namely to protect (protection), preserve (preservation), communication to the customer (communication), and include artistic functions so that consumers who see are interested in buying. Whereas in the packaging bottle the sterilization process is carried out before use, then filling or filling is carried out and if there is permeation, the bottle cap must be replaced.



Figure 3. Secondary Packaging

Secondary packaging is needed to protect the primary packaging during storage in the warehouse, during transportation, and when distributed to large party customers and retail customers. Secondary packaging is also to anticipate transportation modes and road conditions in the distribution system. In products with primary packaging using flexible materials, secondary packaging is often needed to protect the product and its primary packaging. Example: purple yam syrup packaging uses a glass bottle primer that does not have the power to protect itself from outside forces. Therefore, they need the help of secondary packaging, namely 1 bottle box during transportation storage from factories, distributors, stores, until it reaches consumers.



Figure 4. Tertiary Packaging For 12 bottles

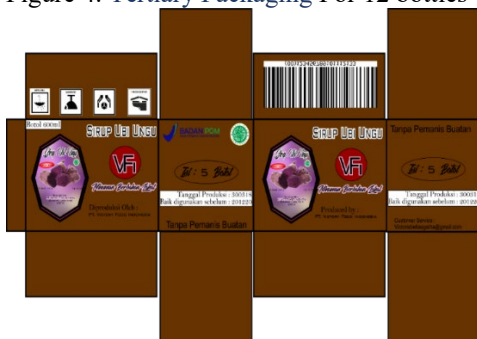


Figure 5. Tertiary Packaging For 5 bottles

Tertiary packaging or often also called transport packaging is a package used to combine all secondary packaging to facilitate the transportation process and prevent product damage. An example of tertiary packaging is cardboard in purple yam syrup products which contain several bottles that are used to facilitate the distribution process so that it reaches the consumers. In the design of the purple cassava syrup packaging using two different boxes for 12 bottles and 5 bottles.

### 3.10 Tools, Materials and Functions for Making Syrups

#### 1. Equipment

- a. Mixer for mixing ingredients.
- b. Scales for weighing materials.
- c. Spoon to stir and add ingredients.
- d. Pot for cooking purple sweet potato syrup.
- e. Stove for cooking purple sweet potato syrup.

#### 2. Materials

- a. Purple Sweet Potato as a raw material for making purple sweet potato syrup
- b. Sugar as an added ingredient.
- c. Maize flour as thickener.
- d. Clean water for washing and additives.

### 3.11 Flow Chart for Making Purple Sweet Potato Syrup

From the process of making purple syrup, you can draw a flow diagram (Figure 6). The functions of several processes above:

1. The raw material is sorted in first to select purple sweet potato which has the standard temperature of the company.
2. Washing is done to wash the dirty sweet potatoes so that they are clean and safe for consumption.
3. Stripping is done to peel the skin and flesh of the sweet potato.
4. Cutting is done to minimize the yams so that it is easy to destroy.
5. Destruction is done to destroy sweet potatoes using water so that they are easily filtered.
6. Filtering is done to produce sweet potato juice which is ready to be made into syrup products.
7. Cooking is done to cook sweet potato juice by adding sugar, citric acid and cornstarch according to the prescribed dose until it thickens to become syrup.
8. Packaging is done to prepare products to be ready to be transported, distributed, stored, sold and used.

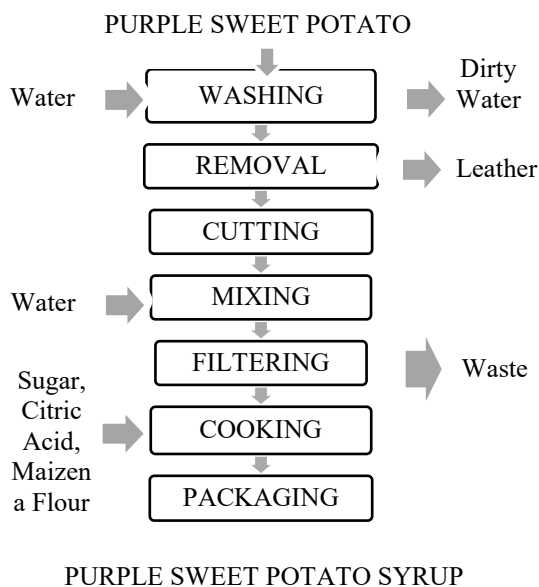


Figure 6. Flow Chart for Making Purple Sweet Potato Syrup

#### 4. Conclusions

Purple sweet potato is one of the food commodities that has the advantage of functional properties, because it contains antioxidants, vitamins and minerals needed by the body. To increase the diversification of food for purple yams, it can be processed into syrup so that it is more practical, easy to consume and very beneficial for the body. Syrup is a type of soft drink in the form of a thick solution with various tastes. Packaging is a process of wrapping, storing or packing a product using certain materials so that the products in it can be accommodated and protected. Packaging is a process of packaging, packaging or packing a product using certain materials. The primary packaging of purple sweet potato syrup in the form of glass bottles and label paper, secondary packaging in the form of boxes to perfect the primary packaging, while for tertiary packaging is in the form of cardboard containing several bottles to facilitate the distribution process.

#### References

- Astawan, M. and Kasih, A.L. 2008. The Efficacy of Colorful Foods. PT. Gramedia, Jakarta.
- Bambang Cahyono, Dede Juanda. 2000. Sweet Potato. Yogyakarta: Kanisius
- Devianti, C. 2013. Comparison of Hydrolysis Methods Using Amylase and Acid Enzymes in Making Glucose Syrup from Starch of Purple Sweet Potatoes.
- Grundy, S. 1995. Action research as on-going professional development. Arts Accord Affiliation of Arts Educators (WA).
- Hannah Bauman and Mikala Sessa. 2016. Food as Medicine: Sweet Potato (*Ipomoea batatas*, Convolvulaceae). Herbal E Gram: Volume 13, Issue 11, November 2016
- Irawan, Aep wawan. 2006. Sweet Potato Cultivation Technique (Thesis): Padjadjaran University.
- Kano, M., Takayanagi, T., Harada, K., Makino, K., and Ishikawa, F. 2005. Antioxidative activity of anthocyanins from purple sweet potato *Ipomoea batatas* Ayamurasaki cultivar. *J. Biosci, Biotechnol, Biochem.* 69 (5): 979-988.
- Kemmis, S., & McTaggart R. 1997. The action research planner. Geelong: Deakin University
- Kouji Miyazaki, Kumiko Makino, Emi Iwadate, Yoriko Deguchi and Fumiyasu Ishikawa. 2008. Anthocyanins from Purple Sweet Potato *Ipomoea batatas* Cultivar Ayamurasaki Suppress the Development of Atherosclerotic Lesions and Both Enhancements of Oxidative Stress and Soluble Vascular Cell Adhesion Molecule-1 in Apolipoprotein E-Deficient Mice. *J. Agric. Food Chem.*, 2008, 56 (23), pp 11485–11492
- Jiang, X. 2001. Sweet Potato Processing and Product Research and Development at the Sichuan Academy of Agricultural Sciences. Inside: Sweet Potato Post Harvest Research and Development in China. Proc. of an Int. Workshop at International Potato Center, pp 114-126.
- McTaggart, R., Henry, H., & Johnson, E. 1997. Traces of participatory action research: Reciprocity
- Ministry of Health RI. 1996. "List of Food Composition" Jakarta Bhratarata.
- Renuka gupta and Kamalinder K. Singh 2007. Stability studies on a cough syrup in plastic containers. *Indian J Pharm Sci*, 2007, 69 (3): 408-413
- Suismono. 1995. Study of the Technology of Making Sweet Potato Flour (*Ipomoea Batatas L.*) and its Benefits for Wet Noodle Extrusion Products. Thesis. Faculty of Agricultural Technology, Bogor Agricultural Institute, Bogor
- Suroto Hadi Saputra, Eldha Sampepana, and Arba Susanty. 2018. Effect of Bottle Packaging, Temperature and Length of Storage of Syrup Tiwai Onion Extract (*Eleutheriana americana* Merr) on Secondary and Microbial Metabolics. *Journal of Industrial Technology Research* Vol.12 No.2 December 2018 156-165
- Sun H, Mu T, Liu X, Zhang M, Chen J. 2014. Purple sweet potato (*Ipomoea batatas L.*) anthocyanins: preventive effect on acute and subacute alcoholic liver damage and dealcoholic effect. *J Agric Food Chem.* 2014 Mar 19;62(11):2364-73.
- Zhang ZC, Su GH, Luo CL, Pang YL, Wang L, Li X, Wen JH, and Zhang JL. 2015. Effects of anthocyanins from purple sweet potato (*Ipomoea batatas L.* cultivar Eshu No. 8) on the serum uric acid level and xanthine oxidase activity in hyperuricemic mice. *Food Funct.* 2015 Sep;6(9):3045-55.

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