Quality "crispy enbal", fortified with seaweed

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Abstract Enbal is the local name of cassava which is popular in the Kei Islands. The purpose of this research is to improve the competitiveness of crispy "Enbal" made from 2 types of enbal (Manihot utilisima) enriched with seaweed (Eucheuma cottonii) to increase fiber content. This research is conducted in two steps. The first stage is the production of "enbal" flour from two types of enbal namely white and yellow enbal then analyzed with antioxidants (beta carotene) and fiber. The second stage is the production of crispy seaweed by adding 10, 20 and 30% seaweed. Then analyzed water content, protein, fat, fiber and beta-carotene. The results of the first phase of the study showed that the white fibers (2.02%) and yellow (2.47%) were not significantly different, while the beta-carotene content of yellow enbal (4.27mg / kg) was higher than the white (<0.02mg / kg). The results of the second stage of the study showed that the yield of crispy seaweed Enbal enriched with 30% seaweed was higher than the other treatments, while the other parameters did not differ.

Keyword: beta-carotene, crispy enbal, seaweed, fiber.

1. Introduction
Kei Island communities (Southeast Maluku) have local food that is already known as substitute food for rice namely “Enbal” (Cassava with high levels cyanide acid). Enbal has been modified and was sold as a snack or a side dish for tea and coffee. This product has a great opportunity to be developed as a regional characteristic if it diversified into a healthy nutritious food because there are quite a lot of enthusiasts. The Research of [9] [8], showed that the nutrient content of cassava was very limited of micronutrients, it needed to be increased, especially for fibre and minerals (Table 1).

Table 1. The nutritional composition of Cassava flour and Seaweed flour as a raw materials for crispy Enbal / Cassava crispy

| No | Parameters     | Cassava flour | Seaweed flour |
|----|----------------|---------------|---------------|
| 1  | Water content (%) | 38,55         | 41,36         |
| 2  | Protein content (%) | 1,03         | 0,70          |
| 3  | Fat content (%)    | 0,43          | 0,20          |
| 4  | Ash content (%)    | 0,88          | 3,40          |
| 5  | Food fiber (%)     | 4,02          | 66,40         |
| 6  | Cyanide acid (mg/kg) | < 3          | No detected   |

As a local food, Enbal is consumed by all of the community. This food is served in variety of ways, namely roasted called fried Enbal, fried called bubuhuk and burned called Enbal bubes (Porna). Crispy Enbal is one of the the results of diversification that is quite lively produced as souvenirs of the region and quite attractive to local communities and outside the Kei islands. Factors effecting the quality Enbal include ingredients, drying techniques and roasting techniques.

Kei island seaweed production in the last 5 years is quite high in continuous to increase [4]. This condition causes the supply of fibre derived from seaweed is quite large. Fibre is very important in the process of digestion of food in the body. Lack of fibre can cause constipation, aperistis, alverculiy, haemorrhoids, diabetics mellitus, coronary heart disease and kidney stones [1]. Traditionally seaweed has long been used as food and medicine because it is rich in mineral, macro and other micro elements. Some types of seaweed contain important minerals that are usefull for the body’s metabolism such as
iodine, calcium, selenium and fiber. So that the utilization of seaweed can be maximized as a source of fiber and on the other hand there is an increase in the quality of local food it is necessary to diversity the product by making the seaweed fortification into the pond and making it more widely accepted by the public as a snack by typical Kei islands.

The purpose of this study was to improve the competitiveness of local food from crispy seaweed Enbal from two types of cassava (Manihot sp) and fortified seaweed (Euchema cottonii) so that the fibre content is better.

2. Materials and Methods

2.1. Time and Place

This research was conducted for 8 months, located in three place, namely in the Tual State Fisheries Polytechnic, Fish Processing Laboratory for the production of flour and crispy seaweed Enbal, as well as in large Agro Bogor Industry Laboratory for the analysis of the quality of Enbal flour and crispy enbal seaweed.

2.2. Material and Tools

2.3. The main raw materials are cassava (Manihot sp), seaweed (Euchema cottonii) and additional ingredients include 1 egg, 200-gram butter, 90-gram liquid milk, 150-gram sugar and 4-gram vanilla. Seaweed (Euchema cottonii) is used as raw material because this type is predominantly cultivated by the community and has a high food content. For packaging used primary packaging of polypropylene plastic and secondary packaging of thick paper (carboard) laminated. The main equipment used includes screw press tools, flour milling tools, blenders, mixers, hock ovens and cassava plate molders (porna).

2.4. Work Procedures

2.4.1. Making Seaweed Porridge

Dried seaweed soaked with rice water for approximately two days (every six hours the water is replaced). After the texture is a bit soft and the fishy smell disappears, the seaweed is heated for about ten minutes then blended until it becomes pulp and filtered.

2.4.2. Making Enbal / Cassava Flour

Enbal with high cyanide acid content is peeled and washed then shredded using a machine. The greater is squeezed using a screw press for about ten minutes until is rather dry. Then milled using a machine into flour and sifted so that the smooth and white obtained.

2.4.3. Plate Enbal Production

140 gram of cassava flour, arranged in a rectangular stainless steel mold (length X width x height = 4.5 cm x 3 cm x 1.5 mm) then baked in an oven for about ten minutes to form a roll plates are rigid, compact and mature. The use of fire that is not too large helps the formation of the texture of cassava plate but does not become good. Then the cassava plates are dried in the sun so that the texture is more compact and not easily broken when dry.

2.4.4. Crispy Seaweed Enbal Production

Ingredients of the dough (eggs, butter, milk, granulated sugar and vanilla) according to the dose are mixed until smooth evenly. As much as 15 % seaweed porridge (by weight of the dough) is added to the mixture and mixed again until evenly mixed. By using a food brush, the dough is spread evenly on the surface of the slime then it is roasted in the oven until cooked for about ten minutes.

2.5. Data Analysis
This study a completely randomized design with three replication. Analyses of variance was performed on proximate data at a 95 % confidences, further tests are done using Duncan Multiple Range Test (DMRT).

3. Results and Discussion

3.1. Quality of enbal as raw material for crispy seaweed enbal

The results of the analysis two types of white dan yellow enbal (cassava) showed that all parameters of the proximate were generally almost the same, except for the antioxidant content (beta carotene). The beta carotene that is owned by yellow enbal is higher than white cassava as shown in Table 2. The results of this analysis are strengthened by the study of [8]; [10] where the beta carotene content was studied from six types of cassava, the highest identified yellow cassava namely around 10.1 – 11.1 µg/g. In this study, although is not as high as the results of the analysis of [10], the beta carotene yellow cassava was higher (4.27 mg/kg) and significantly different from beta carotene owned by white cassava which only contained < 0.02 mg/kg. This is indeed reasonable because yellow cassava is a source of provitamins A. Enbal / cassava high beta carotene is very good used raw materials for making various food products, especially local food. While for the content of white fiber and yellow fiber, in general it is almost the same and statistically not significantly different. [9] also reported that the results of the analysis of white cassava flour contained 4 % of fiber content (Table. 2).

Table 2. White and Yellow Cassava / enbal Quality

| No. | Composition | Type | white cassava (mg/kg) | yellow cassava (mg/kg) |
|-----|-------------|------|-----------------------|------------------------|
| 1   | Beta carotene | < 0.02 | 4.27 |
| 2   | Fiber (%)     | 2.02  | 2.47 |

3.2. Quality of Crispy Seaweed Enbal

The results of the analysis of the nutrient composition of the crispy enbal fortified with porridge seaweed (*Euchema cottonii*) showed in Table 3.

Table 3. Quality of crispy seaweed enbal fortified porridge seaweed

| Treatment | Protein (%) | Fat (%) | Ash (%) | Water (%) | Fiber (%) | Cyanide acid (mg/kg) | Beta carotene (mg/kg) |
|-----------|-------------|---------|---------|-----------|-----------|----------------------|-----------------------|
| 0 % (control) | 1.68±0.04   | 17.01±0.41 | 0.76±0.02 | 4.47±0.18 | 4.18±0.54 | < 3                  | 3.12                  |
| Seaweed 10% | 1.58±0.07   | 15.61±0.35 | 0.54±0.10 | 4.53±0.14 | 7.15±0.23 | < 3                  | 3.59                  |
| Seaweed 20% | 1.46±0.06   | 16.00±0.23 | 0.95±0.03 | 4.57±0.14 | 7.79±0.13 | < 3                  | 3.87                  |
| Seaweed 30% | 1.16±0.06   | 15.08±0.23 | 1.85±0.03 | 4.97±0.10 | 7.81±0.09 | < 3                  | 3.85                  |
Table 3. shows that the crispy seaweed enbal added to different concentration of porridge seaweed has a protein content that tends to decrease. The addition of seaweed 30% can reduce fat content and increase ash and fibre content. This is suspected because seaweed has a low fat content and high fibre (Bu. The highest beta carotene content in the addition of seaweed 20% but not significantly different from the addition of seaweed 30%.

4. Conclusion and Suggestion

4.1. Conclusion

Yellow cassava has higher beta carotene content than white cassava. Crispy seaweed enbal resales fortified with 30% seaweed are generally better because it contains higher levels of ash, fiber and beta carotene.

4.2. Recommendation

Need to increase the addition of seaweed by more than 30% because crispy seaweed enbal is still preferred by consumers.

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