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Mung bean Sprouts skin waste process for environmental sustainability

Mung bean Sprouts skin waste process for environmental sustainability

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Abstract. An important call for food sustainability in the face of the 2040 food crisis is the current trend. On the other hand, statistics show an increasing trend in food waste and cannot be adequately treated. This study seeks to provide an alternative food processing based on waste from mung bean sprout skin. The results of chemical test observations were analyzed based on parametric statistics using Analysis of Variants (ANOVA) using Statistical Product and Service Solution (SPSS) version 20. Based on the findings described above, it can be concluded that the prospective might bean sprouts skin waste to be processed food.

Keywords: waste process; food technology; mung bean sprout skin

1 Introduction

The scientist needs to desperately build up "another and greener insurgency" to expand nourishment creation in a world changed by a worldwide temperature alteration and expected to have an additional 3 billion individuals to sustain by 2040[1], [2]. Discussing food ingredients not only have beneficial effects on our bodies, such as because they contain several chemical compounds that act as anti-inflammatory agents, but also how food is also sustainable[3]. In the same time, the number of food waste also increasing rapidly than we imagine before[4], [5].

Waste or rubbish are substances or materials that are not used anymore. One of the trash or waste that is widely available around the city is market waste. Market waste is a by-product of human activities that are on the market and contain much organic material. Market vegetable waste that has been utilized as animal feed is spinach, kale, cabbage, cauliflower leaves, corn husk, corn stalks, cassava leaves and mung bean sprout skin [6]. Waste of green bean sprouts skin ranks the third-highest after the waste of corn husk and cauliflower leaves. However, according to Purwati et al., green bean sprout skin contains 33% crude fibre, 13% protein, 1.17% fat, 7.35% ash and 45.48% water[7]. Based on the preceding, the mung bean sprout skin still contains high nutrients. According to Puspitasari, green bean sprout skin can be processed without changing its original shape or by changing its shape into flour and flour is used as a variety of food preparations such as making bread, porridge, pastries including cereal flakes[8]. Syahputri and Wardani add that the flouring process is influenced by several factors, including the way and the length of heat contact with the surface of the material, the type of material[9].

Flake is a flat-shaped food product with uneven or flaky edges, lightweight, easy to store, relatively durable because of its relatively low water content of 3-6% and is practical in serving. Flake is classified as a breakfast cereal-ready to eat product which means breakfast cereal products that are ready to eat, and this is because in serving it is enough to add liquid to it like liquid milk[10]. This cereal can also be consumed directly as a snack. These flake products are generally made using essential ingredients with high starch content and tend to be less abundant in fibre needed by the body [11]. Therefore it is necessary to research the utilization of mung bean sprouts skin into flour, especially about the effect of steaming duration and drying time of mung bean sprouts skin on the process of making flour. The resulting flour is then used as flakes.

2 Methodology

The first step is to make mung bean shells flour according to treatment[12]. The treatments are steaming time (K1 = 20, K2 = K3 = 30 and 40 minutes) and drying time (P1 = 11, P2 = 13 and P3 = 15 hours), then the resulting flour is processed into flakes[13]. Flakes produced from various treatments were chemically analyzed (carbohydrate, protein, fat, water and crude fibre levels (AOAC, 2012) and tested organoleptic (taste, colour and crispness) using a hedonic test with seven scales[14].

The results of chemical test observations were analyzed based on parametric statistics using Analysis of Variants (ANOVA) using Statistical Product and Service Solution (SPSS) version 20. If the results of the analysis of the effect of significant differences between treatments, then carried out further tests using the Least Significant Difference Test (BNT) at the level of confidence $\alpha = 95\%$[15].

Non-parametric data covering Organoleptic Test of colour, aroma, taste and crispness were tested based on the level of panellist preference, to determine the effect of whether or not a treatment on organoleptic tests was carried out by the Kruskal Wallis Test [14].

3 Results and Discussion

3.1 Flake Chemical Test

The results of the analysis of variance showed that the different interaction interactions between steaming time and drying time did not significantly affect the levels of protein, carbohydrates, fats, water and crude fibre of the mung bean sprouts skin flake. Average levels of protein, carbohydrate, fat, water and crude fibre of peanut flake skin sprouts at different steaming times and drying times can be seen in Table 1.

Table 1. Average levels of protein, carbohydrates, fats, water and crude fiber flakes of mung bean sprouts during steaming time and drying time

No	Treatment	Protein Level (%)	Carbohydrates Level (%)	Fat Level (%)	Water Content (%)	Crude fiber level (%)
1	K1P1	11,76	41,36	7,30	1,95	32,27
2	K1P2	11,37	42,24	7,60	1,33	32,08
3	K1P3	11,48	43,04	7,15	1,17	32,09
4	K2P1	11,34	43,40	5,61	2,35	32,02
5	K2P2	11,33	43,93	5,41	2,05	32,07
6	K2P3	11,23	44,24	6,26	1,59	31,91
7	K3P1	11,22	40,72	8,82	1,35	31,87
8	K3P2	11,12	41,41	8,68	1,55	31,83
9	K3P3	11,12	42,26	8,41	1,01	31,78

Table 1 shows that the longer the steaming process, the lower protein content of mung bean sprout skin flakes, whereas the shorter the steaming process, the higher the protein content in mung bean sprout skin flake. This is consistent with the opinion of Lusiyatiningsih that the decrease in protein levels is caused by the process of steaming that is too long[16]. Zakaria also revealed that proteins,

fats and several other nutrients could not stand the heat at too long steaming time. Heating too long for the protein will experience denaturation or damage[17].Winarno revealed that any treatment that involves heat could reduce its nutritional value[18]. Also, heating can cause some carbohydrates to break down into simpler compounds with more prolonged heating, a decrease in carbohydrate levels in the resulting flake. Other researcher further said that in the process of steaming flakes, there is a heating effect on carbohydrates in the polysaccharide group such as starch broken down into simpler components, oligosaccharides, disaccharides and monosaccharides[19].

The loss of water from the material due to drying causes the concentration of the components of the material so that the percentage increase in the component ingredients[18]. In general, flake fibre content is 11.7% (Indonesian Nutritionists Association, 2011), but with the addition of green bean sprout flour, the resulting flake contains higher fibre content, which is between 31.78 - 32.27% to increase flake nutrition. According to Ikmal, fibre is needed by the body, especially to help digestion[20].

3.2 Organoleptic Flake Test

The results of the non-parametric analysis of the organoleptic test showed that the colour, aroma, taste and crispness of the mung bean sprouts skin flake were judged to be somewhat liked to like by the panellists. Organoleptic test results of mung bean sprout skin flake can be seen in Table 2.

Table 2. Organoleptic Test Results of Green Bean Sprout Skin Flakes.

Parameter	Test Value	Test Criteria	Treatment
Colour	4,9	Rather like	Steaming Time 30 minutes : Drying Time 11 hours
Aroma	5,2	Rather like	Steaming Time 30 minutes : Drying Time 11 hours
Taste	5,5	Rather like	Steaming Time 40 minutes : Drying Time 11 hours
Crispness	5,8	Like	Steaming Time 40 minutes : Drying Time 15 hours

The difference in the colour of the green bean sprout skin flake is caused by the process of steaming and the flake mixture which was initially a green bean flour skin floured in light green to dark green to black. After the drying process in the open air, the green bean sprouts skin flake will be carried out with the oven, which can affect the colour of the green bean skin flake to become darker.

The distinctive aroma of mung bean sprout skin is not so acceptable to panellists because the unpleasant scent of flake products is still felt. In terms of the taste of the green bean sprout skin flake produced with a value of 5.5 (somewhat like) is still declared following the quality of pastries that is the typical usual pastries.

The crispness of the mung bean sprout skin flake during the steaming 40 minute treatment time and 15 hours of drying time gave the highest value of crispness of 5.8 which means that the mung bean sprout skin flake was judged to be somewhat liked by the panellists.

3.3 Determination of the Best Treatment

Based on the determination of the best treatment using the effectiveness test on all research parameters including parametric data which includes chemical tests consisting of levels of protein, carbohydrates, fats, water and crude fiber as well as non-parametric data covering organoleptic tests consisting of color, aroma, taste and crispiness showed that the treatment of steaming time of 20 minutes and drying time of 13 hours was the best treatment of 0.52 with the parameter criteria being protein content 11.22%, crispness 5.2 (somewhat like), color 4.6 (somewhat like), water content 1.35%, taste 5.5 (somewhat like), carbohydrate content of 40.72%, fat content of 8.82%, crude fiber content of 31.87% and aroma of 4.7 (rather like).

4 Conclusion

Based on the findings described above, it can be concluded that the prospective mung bean sprouts skin waste to be processed food. This waste-based food processing will be a solution to the needs of the food crisis that will be faced by the world in 2040. Besides answering the need for food supply, this processed waste is also a solution to maintain the environment and ecosystem free from waste.

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