Optimalization Flour Composite Nutritiose as Basic Materials Processing for Food Products

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Abstract

In Indonesian are still many communities that food insecurity and malnutrition. One reason is the consumption pattern and affordability to get a quality product or nutritious food is relatively limited, so it is necessary, efforts to resolve the issue. Therefore, this study was planned to be one of the solutions to overcome the problems of food and nutrition insecurity society. The research is the optimization of the composition of mocaf flour,dregs of tofu, soy pulp, and rice bran in the manufacture of composite flour. The results obtained include: the yield of mocaf flour obtained amounted to 33.55% and has a protein content 2.20%, starch content 75.30%, water content 7.12%, the yield of tofu'sdregs know obtained amounted to 11.2% and has a protein content of 28.62%, starch content 23.42%, water content 9.69 %, the yield of soy pulp obtained at 8.75% and has a protein content 24.18%, strach content 18.80%, moisture content 8.22% and yield of rice bran flour obtained amounted to 37.06% and has a protein content 9.02%, starch content 24.12%, water content 6.69%.

Keywords: optimization, mocaf flour,dregrs of tofu, soy pulp, rice bran

1. Introduction

Food and nutrition insecurity in Indonesian society due to food consumption patterns which are not in accordance with the standards of consumption and nutrition of fresh and processed food products consumed, resulting in non-fulfillment of standards Desired food pattern(PPH). Therefore, it is indispensable efforts of various parties to create a food product that is affordable by the lower layers of society and at the same time or a nutritious quality to meet nutritional standards. Nutritional standards is a food product that contains protein, fat, carbohydrates, vitamins, minerals, and functional substances that can nourish the human body. To meet the nutritional needs, then one attempts to do is to create a composite flour as a raw material for processing derivatives of processed food products are relatively inexpensive. How that can be done is to revitalize the waste materials or by-product from the processing industry knows that dregre of tofu, soy pulp, rice bran, and mocaf flour treated as a byproduct of cassava processing industry. So expect the processed products of its food can be affordable and liked by the people.

Dregs of tofu is a byproduct of the tofu industry that they have a relatively high content of nutrients, especially protein content, which is about 7-10%. soy pulp is also a byproduct of the soy industry is also still relatively high protein content 20-28%. Rice bran is a byproduct of rice milling industry has a content of vitamins (Vitamin B1 and B2, as well as other relatively high). While mocafflour is a fermented cassava flour that is a source of carbohydrates (starches) together with a relatively high starch content in cassava, which is about 60- 70%. Seeing the potential of protein and vitamins and

starch that is in the source, then it has the potential to be processed into composite flour nutritional value, which contains proteins, carbohydrate, fats, vitamins, minerals, and substances of functional, so the researchers looked at the need for used as raw material for the manufacture of food processed further.

2. Material and Methods

2.1.Materials

Materials for the manufacture of composite flour include dregs of tofu, soy pulp, bran and cassava peel. While the materials for the purposes of chemical analysis includes reagents for the analysis of protein, carbohydrate, fat, and fiber.Tools for manufacture of composite flour covering dryer, flour miller, slicer, screen, mixer, and tools for analysis.

2.2.Method

The study is expected to produce composite flour nutritious as raw materials for advanced processing of derivative products. The research method includes a preliminary stage and the main stage of research. Preliminary phase of the research is to analyze the chemical dregs of tofu, soy pulp, and rice bran, and make processing flour of tofu's dregs,soy pulp flour, and rice bran flour and mocaf flour. The main phase of the study is to formulate the composition of flour of tofu's dregs (t_1), soy pulp flour (t_2), rice bran flour (t_3), and mocaf flour (t_4) with the formulation as follows:

- f1 is $t_1 : t_2 : t_3 : t_4 = 1 : 3 : 1 : 5$
- f2 is $t_1 : t_2 : t_3 : t_4 = 2 : 2 : 1 : 5$
- f3 is $t_1 : t_2 : t_3 : t_4 = 3 : 1 : 1 : 5$
- f4 is $t_1 : t_2 : t_3 : t_4 = 3 : 5 : 2 : 10$
- f5 is $t_1 : t_2 : t_3 : t_4 = 5 : 3 : 2 : 10$

The experimental design will be used in this study is a randomized block design with five treatments and five replications, so therefore there will be a 25 experiment. To prove the effect of the formulation of all responses observed variables, the analysis data, using the experimental design as follows:

$$Yij = \mu + \tau i + \varepsilon ij \quad [1]$$

Based on the above experimental design can be made analysis of variance (ANOVA), to obtain conclusions about the effect of treatment formulations. The response to research that analyzed the composite flour of various formulations (the analysis of protein content, starch content, fat content, fiber content, moisture content and ash content).

3. Result and Discussion

*3.1.*Result

Raw materials analysis was conducted to determine the chemical composition of cassava peel, dregs of tofu, soy pulp, and rice bran are used as raw material in the manufacture of composite flour. The results of chemical analysis of raw materials can be seen in Table 1.

Flour analysis was conducted to determine the chemical composition mocaf flour, flour of tofu's dregs, soy pulp flour, and rice bran flour are used as the main raw material in the manufacture of composite flour. The results of chemical analysis mocaf flour, flour of tofu's dregs, soy pulp flour, and rice bran flour can be seen in Table 2.

Table1. Analysis of Chemical Raw Materials

Type of Material	Results of Analysis					
	Protein Content (%)	Strach Content (%)	Fat Content (%)	Fiber Content (%)	Water Content (%)	Ash Content (%)
Cassava peel	1.14	44.80	0.38	5.91	45.12	1
Dregs of tofu	8.40	9.62	9.71	10.66	59.08	2.93
Soy pulp	10.88	9.75	7.80	16.10	45.61	2
Rice bran	8.72	23.42	4.51	42.94	14.69	3.50

Table 2.Results of Chemical Analysis Mocaf Flour, Flour of Tofu's Dregs, Soy Pulp Flour, and Rice Bran Flour

Type of flour	Results of Analysis					
	Protein Content (%)	Strach Content (%)	Fat Content (%)	Fiber Content (%)	Water Content (%)	Ash Content (%)
Mocaf flour	2.20	75.30	0.68	10.82	7.12	2.50
Flour of Tofu's Dregs	28.62	23.42	14.71	16.96	9.69	3.50
Soy Pulp Flour	24.18	18.45	16.80	23.12	8.22	2.95
Rice Bran Flour	9.02	24.12	4.80	49.34	6.69	2.80

Table 3. Results of Chemical Analysis Flour Composites

Chemical Characteristics	Formula I	II	III	IV	V
Protein Content (%)	12,94	13,00	13,21	13,79	13,73
Fat Content (%)	7,33	7,12	9,97	10,29	7,02
Strach Content (%)	48,14	48,84	47,04	45,49	49,18
Fiber Content (%)	18,98	18,36	17,75	18,67	18,05
Water Content (%)	7,36	7,82	7,98	7,74	7,88
Ash Content (%)	2,76	2,82	2,88	2,79	2,85

Tabel 2 shows that the difference in the type of flour affect the value of the protein content, strach content, fat content, fiber content,water content, ang ash content. All type of flour are used as a flour substitute or composite flour for the manufacture of products, so it can produce a product that is more diverse and can reduce the use of wheat flour.

In the process of making mocaf flour obtained mocaf flour weighing 2096 grams from 6247 grams of cassava peel, so the yield of mocaf flour obtained at 33.55%. In the process of making flour of tofu's dregs obtained 280 grams of flour with a weight of 2,500 g pulp, so that the yield of starch Dregs of tofu obtained amounted to 11.2%. In the process of making soy pulp flour obtained 175 grams of flour weighing 2,000 grams of soy pulp, so that the yield of soy pulp flour obtained at 8.75%. In the process of making rice bran flour obtained bran flour weighing 5000 grams from 1853 grams of rice bran, bran flour thus obtained yield of 37.06%.

a. Protein levels

Based on the ANOVA can be seen there is a noticeable effect on the level of 5% protein contentof composite flour.

Table 4. Protein Content(%) of Composite Flour with several formulation

Treatment	Protein Content
f1	12.94[a]
f2	13.00[b]
f3	13.21[c]
f5	13.73[d]
f4	13.79[e]

Information:The same letter in the column showed no significant difference in the level of 5%

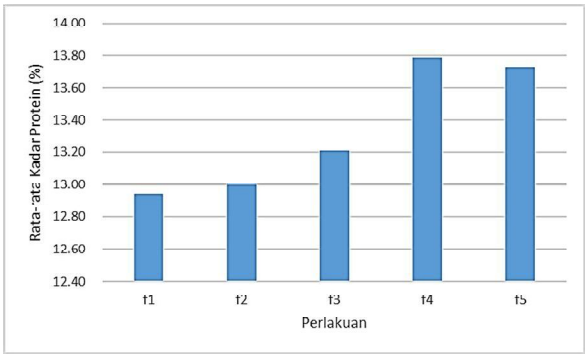

Figure 1. Influence Formulation on Protein Content of Composite Flour (%)

b. Fat level

Based on the ANOVA can be seen there is a noticeable effect on the level of 5%fat contentof composite flour

Table 5. Fat Content(%)of Composite Flour with several formulation

Treatment	Fat Content
f5	7.02[a]
f2	7.12[b]
f1	7.33[c]
f3	9.97[d]
f4	10.29[e]

Information:The same letter in the column showed no significant difference in the level of 5%

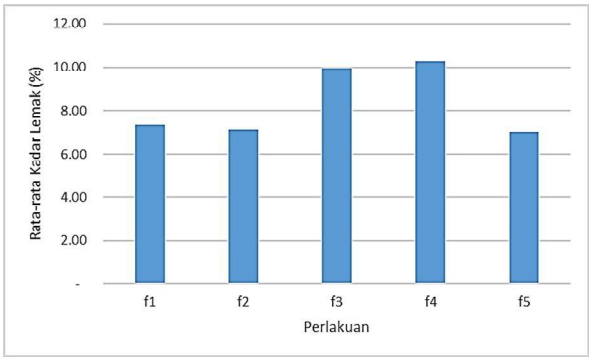

Figure 2. Influence Formulation on Fat Content of Composite Flour (%)

c. Starch Content

Based on the ANOVA can be seen there is a noticeable effect on the level of 5%strach contentof composite flour

Table 6. Starch Content(%) of Composite Flour with several formulation

Treatment	Starch Content
f4	45.49[a]
f3	47.04[b]
f1	48.14[c]
f2	48.84[d]
f5	49.18[e]

Information:The same letter in the column showed no significant difference in the level of 5%

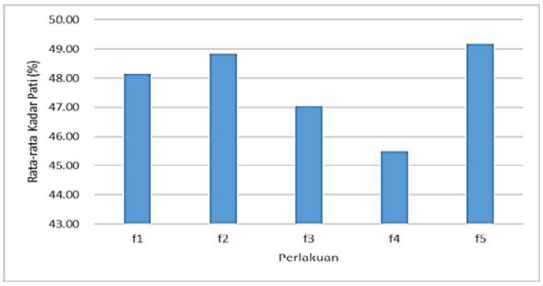

Figure 3. Influence Formulation on Strach Content of Composite Flour (%)

d. Fiber Content

Based on the ANOVA can be seen there is a noticeable effect on the level of 5%fiber contentof composite flour

Table 7. Fiber Content(%) of Composite Flour with several formulation

Treatment	Fiber Content
f3	17.75[a]
f5	18.05[b]
f2	18.36[c]
f4	18.67[d]
f1	18.98[e]

Information:The same letter in the column showed no significant difference in the level of 5%

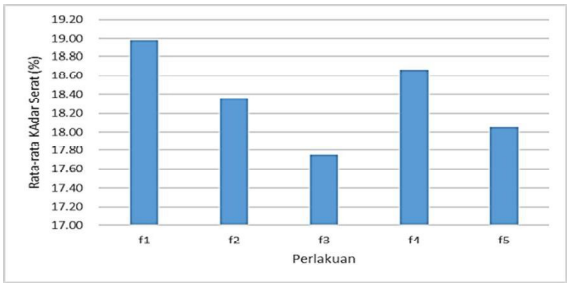

Figure 4. Influence Formulation on Fiber Content of Composite Flour (%)

d. Water Content

Based on the ANOVA can be seen there is a noticeable effect on the level of 5% water content of composite flour.

Table 8. Water Content(%) of Composite Flour with several formulation

Treatment	Water Content
f1	7.36[a]
f4	7.74[b]
f2	7.82[c]
f5	7.88[d]
f3	7.98[e]

Information:The same letter in the column showed no significant difference in the level of 5%

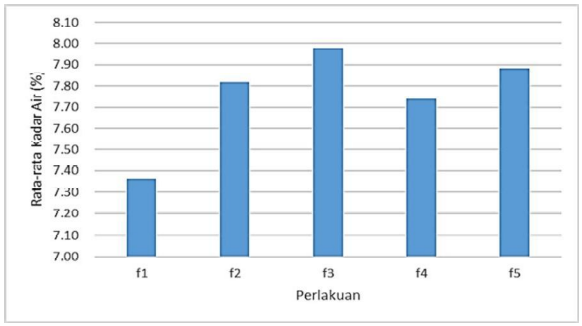

Figure 5. Influence Formulation on Water Content of Composite Flour (%)

f. Ash Content

Based on the ANOVA can be seen there is a noticeable effect on the level of 5%ash contentof composite flour.

Table 9. Ash Content(%) of Composite Flour with several formulation

Treatment	Ash Content
f4	2.76[a]
f1	2.79[ab]
f2	2.82[bc]
f5	2.85[cd]
f3	2.88[d]

Information:The same letter in the column showed no significant difference in the level of 5%

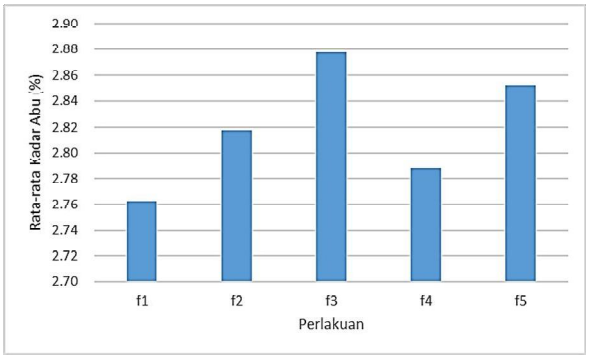

Figure 6. Influence Formulation on Ash Content of Composite Flour (%)

3.2. Discussion

Evaporation of water from the material to the hot dry air that occurs because of differences between the relative humidity of the dry air at the surface of the dried material causing the driving force or a pressure difference of water vapor in the water vapor pressure materials with dry air. The situation is causing the evaporation of moisture from the material to air dry. Drying of a material by blowing hot dry air that resulted in the evaporation rate of water from the dried material will increase [2]. Events evaporation of water from the dried material begins with the depletion layer of air barrier between the surface of the material dried with air environment due to the hot dry air blowing. Blowing hot dry air that is given continuously during drying results in an increase in the vapor pressures difference dean material surface with the water vapor pressure in the dry air so that water on the surface of the material will evaporate. The difference in concentration of water causes water in the material will diffuse into the surface of the material and the evaporation of water. This occurs until equilibrium is achieved between the water content in the material with water content in the air is dry.

Protein is a nutrient that is essential for the body because these substances in addition to functioning as a fuel in the body also serves as a builder substance and regulators [3]. Based on the results obtained by analysis of protein content in mocaf flour is 2.20% while according to Codex Stan 176-1989 expressed protein content in mocaf flour from meat casava maximum of 1.0% [4]. The protein content is slightly higher than mocaf flour made of meat cassava because of a protein in 100 grams of cassava peel is 8.11 g, while in 100 g of meat cassava protein content of only 1g so that we can conclude the protein content of cassava peel is higher than the protein content of meat cassava, supposedly this is very influential on the protein content of the flour produced mocaf [5].

The carbohydrate content of fresh cassava peel is 4.55%, making it possible to use as an energy source for microorganisms in the fermentation process. Besides cassava peel also contains tanins, enzymes peroxide, glycated, calcium oxalate, fiber, and HCN [6].The content of HCN in cassava peel can be reduced through several treatments include soaking, boiling and fermentation. The fermentation process can reduce the content of HCN and increasing the energy content, protein, crude fiber, as well as improve the digestibility of low-quality food ingredients [7]. The microbes used in the fermentation process can produce enzymes that will degrade complex compounds into simpler and synthesize a protein that is a protein enrichment process material (protein enrichment). This microbial protein commonly called Single Cell Protein [8].

Based on the results obtained by analysis of protein content in dregs of tofu amounted to 28.62%. Protein content dregs of tofuis higher due to the processing of dregs of tofu is not too much squeezed while still wet, when the fresh dregs of tofu obtained directly carried steaming to reduce the water content and drying so that the protein content is high and quite good.

Based on the results obtained by analysis of protein content in soy pulp flour amounted to 24.18%. The result is not too much different because the process of making soy pulp carried out by the same process by

soaking in water at room temperature not hot water that can damage proteins. Immersion aims to eliminate the high levels of NaCl on the lees. Soy pulp has a relatively high nutrient content, especially protein, because in the process of making soy sauce only a small percentage of soy protein and soluble utilized in soy sauce, while the remaining dregs left in soy sauce [9].

Based on analysis of the protein content of the rice bran flour is at 9.02%. States that proteins are very sensitive to heat and will change the chemical structure (denaturation) as a result of warming [10]. States high heat will cause degradation of the protein molecules [11]. The degradation products produced many protein derivative which is soluble in water.

Based on the analysis of water content in mocafflourat 7.12%, flour of tofu's dregsat 9.69%, soy pulp flour at 8:22%, and 6.69% at rice bran flour. In research Codex Stan 176-1989 stated maximum water content in flour mocaf is 13% so that it can be concluded mocaffrom cassava peel within limits.

Ash is one component in foodstuffs. This component consists of minerals such as potassium, phosphorus, sodium, magnesium, calcium, iron, manganese, and copper [12]. Minerals is one of the essential nutrients needed by the body in small amounts. Based on analysis of the ash content of 1% mocaf flour, flour of tofu's dregs3.50%, and the soy pulp flour amounted to 2.95%, while the rice bran flour amounted to 2.80%. The relatively low ash content allegedly because the mineral nutrient content of non-starch flour are high enough, resulting in the content of ash in the flour in this study is low. This is consistent with the statement of Nabil that the lower non-mineral components contained in the materials will further lower the percent of ash in the material [13]. The ash content depending on the type of material, means of ashing, the time and temperature used during the drying.

Based on analysis of the fiber content in mocaf flour amounted to 10.82%, 16.96% on flour of tofu's dregs, soy pulp 23.12%, and rice bran flour49.34%. Results fiber content in flour is relatively higher than the raw material, and this is one of the components contained in the material which led to reduced water levels rising flour fiber.

Drying have an influence on the nutrients, because the heat can cause degradation in these nutrients especially the provision of heat. Damage nutrients in dried foodstuffs closely linked to temperature and drying time. The increasing drying time and temperature will increase in losses of nutrients.

Based on the analysis of variance (ANOVA) with a model in one direction (one way) against the five formulas (f_1, f_2, f_3, f_4 and f_5) mixing the mocaf flour, flour of tofu's dregsflour, soy pulp flour, and rice bran flour shows the difference significantly for the response levels of protein, starch, fat, fiber, water, and ash at the 5% significance level.The real difference of the components caused by the composition of the raw starch containing macro nutrients are not the same, so that the resulting composite flour which has a different composition for protein, fat, starch, fiber, water and ash. The basic ingredients of soy pulp and dregs of tofu provide a response to the protein and fat content is relatively high, while the base material rice bran responded fiber and ash are relatively higher than the source material other basic, basic materials mocaf respond starch content is relatively higher than on sources other basic materials.

Based on the survey results revealed that each portion contains the basic ingredients have nutritional components that are not the same and each has specific characteristics. Mocaf flour is oriented as a source of carbohydrate (starch), while other basic materials are relatively less starch content. The basic ingredients of soy pulp and dregs of tofu oriented as a source of protein

and fat, while mocaf flour and rice bran protein content is low, but on the other rice bran is rich in fiber. So therefore the results of this study are targeted to create composite flour of high nutritional value, protein, fat, starch, water and fiber are proportional, so expect the composite flour can be used as a source of raw materials to the processing of derivative food products nutritional value high to meet the nutritional needs for consumers society in general.

The response to the ash content, f_1 to f_4 treatment showed no significant difference, f_1 to f_2 treatment showed no significant difference, f_2 to f_5 showed no significant difference, and with f_3 to f_5 showed no significant difference. However, ash and water is not one of the considerations to determine the selection of the use of composite flour as a raw material in the processing of food products derived further, but only used as a reference characteristic

Conclusion

Based on preliminary research results can be summed content of the raw materials can be used as the manufacture of composite flour that can be used in the manufacture of food products. The yield of mocaf flour obtained at 33.55%, the yield of Flour of Tofu's Dregs obtained for 11.2%, the yield of soy pulp obtained at 8.75% and the yield of rice bran flour obtained at37.06%.

The use of composite flour for processing raw materials derived food products can then be considered as follows:

a. If considering a composite flour as raw materials for food products derived by considering the levels of protein and fat, it can be used formula f_4, the composite flour containing 13.79% protein and fat at 10.29%.
b. If considering a composite flour as raw materials for food products derived by considering the starch content, it can be used formula f_5, the composite flour containing starch amounted to 49.18%.
c. If considering a composite flour as raw materials for food products derived by considering the fiber content, it can be used formula f_1, ie composite flour contains fiber by 18.98%.

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