The effect of temperature variations on koro sword bean flour (Canavalia ensiformis L) and the concentration of the addition of koro sword bean flour on cyanide acid (HCN) content and consumer acceptance of fried chicken seasoning flour

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Abstract. This study aims to determine the effect of drying temperature and concentration of addition of koro sword bean flour on the HCN content and organoleptic properties of the fried chicken seasoning flour produced and to obtain the drying temperature and concentration of koro sword bean flour that are right for producing fried chicken seasoning flour that is most liked by consumers. The experimental design used was a factorial completely randomized block design (RABL) consisting of two treatment factors with three replications. The first factor was the variation in drying temperature of koro sword bean flour (60°C, 70°C, and 80°C). The second factor is the concentration of the addition of koro sword bean flour (10%, 15%, and 20%). The results showed that drying temperature had an effect on HCN content and taste preferences but did not affect colour preferences of fried chicken seasoning. The most preferred fried chicken seasoning flour is at a drying temperature of 80°C with 29.73ppm HCN, while the concentration of flour which was able to produce the most preferred fried chicken spice flour was 20% with 36.50ppm HCN.

1. Introduction

The existence of local food is starting to disappear and be forgotten due to the lack of public awareness to use it as an alternative food as well as in the variety of daily foods, and their lack of knowledge about local food processing into reduced food. Local food processing activities at the household and small-scale industry develop very slowly and tend not to develop. The farming community still sells raw materials (primary) and buys processed products from large industries at much higher prices. Beans and local foods that use flour / semi-processed form (intermediate products) which can increase storage capacity, increase storage space, increase use-value, easy to process, and can be formulated into composite flour [1]

Koro sword bean is a type of legume that is very suitable for making animal feed, is koro sword bean. The protein contained in the koro sword bean is around 27.4% [2]. Koro sword bean seeds are a local food that contains quite high protein around 18-25%, while the fat content is very low 0.2-3.0% and relatively high carbohydrate content of 50-60%. This korosword bean is recommended as a source of protein for food because the balance of amino acids is very good, the bioavailability is very high and the anti-nutritional factors are low. In addition, koro sword bean contains vitamin B which plays a role
in helping the body's energy metabolism, vitamin B2, and vitamin C to maintain the body's immunity. Several minerals and dietary fibre are important for health and contain isoflavones which are good for the body as anti-oxide free radical scavengers [3]. Dry and mashed koro sword bean can be used as a substitute for wheat flour. This is very helpful to reduce our level of dependence on wheat which has an unstable price. The advantages of sword beans in the form of flour are added to the nutritional function of flour, have a longer shelf life, can produce products that have high economic value, and facilitate distribution because they have lighter weight and a more compact form [4].

The process of making flour influenced by drying temperature, improper drying process will result in the nutritional components contained in food ingredients will be damaged. According to [5], the drying process aims to remove or reduce unwanted biological activities, such as enzyme and microbial activity. The drying temperature is usually carried out at a temperature of 50-700C, taking 10-18 hours. The drying temperature of koro sword bean with high temperatures has several weaknesses, namely changes in physical and chemical forms as well as quality degradation and results in browning [6]. Drying the koro sword bean at low temperature is available for a long time and increases the air content so that mould growth.

Wheat flour is one of the main foodstuffs in Indonesia as the main ingredient for bakery, noodles, and seasoning flour. Seasoned flour has been developed due to high consumer demand and fast food restaurants serving flour fried food, especially fried chicken. Along with the increase in fast-food restaurants resulting in high market demand for ready-to-eat seasoning flour, it is necessary to develop seasoning flour which has nutritional value, especially protein, vitamin B2, and riboflavin, so that it has the opportunity to be added to seasoning flour. Seasoned flour has been developed due to high consumer demand and fast-food restaurants that serve flour fried food, especially fried chicken. Seeing the potential of koro sword bean flour which contains a nutritional value, especially protein, vitamin B2, and isoflavones, it has the opportunity to be added to seasoned flour.

Based on the description of the problems above, it is necessary to conduct research on variations in the drying temperature of koro sword bean to produce koro sword bean flour which is safe to add in making seasoning flour with a certain concentration.

2. Material and methods

2.1. Material
The materials used in this research were white sword koro sword bean (Canavalia ensiformis L), wheat flour, sago flour, fine salt, garlic powder, egg white powder, flavourings, and baking powder. Materials for analysis include aquadest, NaOH, H2SO4, CuSO4, 2% Na Bisulphite, petroleum ether, and other materials such as filter paper and aluminium foil.

2.2. Tools
The tools used in this study were a basin, sieve, cabinet dryer, or oven, blender, analytical scales, while the tools for analysis were measuring cups, test tubes, stirrers, beaker cups, erlenmeyers, water handles, pipettes, distillatory, spectrophotometer, Soxhlet kit, burette and static.

2.3. Research location
The research was conducted in the laboratory of the Faculty of Agricultural Technology INSTIPER and Yogyakarta Assessment Institute of Agriculture Technology.

2.4. Research Method

2.4.1. Experimental Design
The experimental design used in this study was a Complete Block Design (RBL) or Randomized Complete Block Design (Gomez and Gomez, 1984) with two factorials, namely the drying temperature variation factor (A1 600C; A2 700C; A3 800C) and the flour substitution variation factor (B1 10%; B2
15% and B3 20%) with 2 replications. In order to know the effect of the treatment, it was tested with Duncan's multiple range test (DMRT) at the 5% real level [7].

2.4.2. Decreased levels of cyanide acid (HCN) of koro sword bean seeds [8]

![Flow diagram of the process of decreasing cyanide acid (HCN) levels of koro sword bean](image)

**Figure 1.** Flow diagram of the process of decreasing cyanide acid (HCN) levels of koro sword bean

2.4.3. Make a formula for fried chicken flour
Seasoning flour formula as in Table 1.

| Table 1. Fried chicken seasoning flour formula with koro sword bean flour substitution |
|---------------------------------|-----|-----|-----|
| Composition            | B1  | B2  | B3  |
| Koro sword bean flour   | 5.00| 7.50| 10.00|
| Wheat flour             | 45.00| 42.00| 40.00|
| Sago flour              | 30.00| 30.00| 30.00|
| Garlic powder           | 5.00 | 5.00 | 5.00 |
| Egg white powder        | 5.00 | 2.00 | 5.00 |
| Baking powder           | 2.00 | 5.00 | 2.00 |
| Salt                    | 5.00 | 3.00 | 5.00 |
| Flavouring              | 3.00 | 3.00 | 3.00 |

Note: Description: wheat flour used 50g
B1: 10% koro sword bean flour
B2: 15% koro sword bean flour
B3: 20% koro sword bean flour

2.4.4. Observation parameters
The parameters observed in this study were HCN, moisture content, and consumer preference test (organoleptic test).

3. Result and discussion
Effect of drying temperature of koro sword bean to produce koro sword bean flour and substitution of koro sword bean flour in the manufacture of fried chicken seasoning flour with the observation parameters of HCN levels and organoleptic tests on the aroma, colour and taste of fried chicken flour.

3.1. Analysis of cyanide acid (HCN) levels and moisture content
The procedure for analysing the HCN content in flour was carried out using the foodstuff analysis method [9]. HCN levels analysed the food safety of fried chicken seasoning flour, the HCN content in koro sword bean around ± 264.3 ppm [10]. The maximum safe limit of HCN in foodstuffs is 40 ppm [11-16].

Based on the results of the analysis of cyanide acid (HCN) content, it showed that the treatment of drying temperature and the proportion of addition of koro sword bean flour had a significant effect on the cyanide acid (HCN) content of fried chicken seasoning flour. The higher the drying temperature, the
lower the cyanide acid (HCN) content, as well as the addition of koro sword bean flour, the greater the addition, the higher the cyanide acid (HCN) content. To determine the difference between treatments, a 5% real level DMRT test was carried out, the results of which are presented in the graph of the relationship between drying temperature and the substitution of peanut flour in Figure 2.

Based on Figure 2, the drying temperature of making koro sword bean flour has a significant effect on the HCN content of fried chicken seasoning flour. The higher the drying temperature results in the fried chicken seasoning flour with lower HCN levels. Reducing the HCN levels of koro sword bean with treatments such as drying, boiling, and reducing the size because HCN compounds are volatile and volatile when heated. This is supported by [11] that boiling, stripping, reducing the size, immersing in air, drying and cooking are processes to reduce HCN levels. The washing process in the airflow and adequate countermeasures helps prevent toxic HCN from forming. The release of HCN depends on the presence of the glycosidase enzyme and the presence of air. The percentage of the concentration of koro sword bean flour can increase the HCN level of the fried chicken seasoning flour because the most constituent components of fried chicken seasoning flour contain HCN compounds.

3.2. Moisture Content

Moisture content is one of the parameters for seasoned flour products. Moisture content was analysed by the AOAC 2005 method. According to SNI 01-4476 1998, the maximum moisture content of commercial seasoning flour is 12%. The moisture content of fried chicken seasoning. Based on the results of statistical analysis, it shows that the drying temperature treatment has a significant effect on the air content of the flour, the higher the drying temperature, the lower the air content, while the addition of sword bean flour has no significant effect on the air content of the fried chicken seasoning flour.. To find out the difference between the drying temperature treatments of koro sword bean, a which is presented the graph of the relationship between drying temperature and flour substitution on the moisture content of seasoning flour is shown in Figure 3.

Based on Figure 3, the relationship between drying temperature and variations in the substitution of koro sword bean beans on moisture content.
3.3. Organoleptic Test

3.3.1. The Preference test for color
The organoleptic test of color preference is a parameter of consumer assessment to determine consumer acceptance of the color of food products. To determine the effect of treatment on the color preference of fried chicken seasoning, a diversity analysis was carried out.

Based on the analysis it can be seen that the drying temperature of the beans and the variation of the substitution of koro sword bean flour has no effect on the organoleptic yield of colour preferences. There is also the average favourite colour of the fried chicken seasoning flour as shown in Figure 4.

![Graph of the relationship between drying temperature and flour substitution to preference. colour of fried chicken seasoning flour](image)

Figure 4 Graph of the relationship between drying temperature and flour substitution to preference. colour of fried chicken seasoning flour

Based on Tabel 7 and Pictures 4 the drying temperature did not affect the panellists’ preference for the colour of the fried chicken seasoning flour. This is due to the colour produced by the fried chicken seasoning flour with almost the same temperature treatment so that the panellists’ could not distinguish fried chicken.

The percentage of adding koro sword bean flour does not affect the color of the fried chicken seasoning flour. The concentration with the addition of 10-20% in the fried chicken seasoning flour produces a yellowish-white flour color so that it does not affect the panelists’ preference for color.

3.3.2. The Preference test for flavor
The aroma preference exam is a parameter for panellists’ assessment to determine consumer acceptance of the aroma of food products. Based on the results of the analysis of diversity, it can be seen that variations in the substitution of koro sword bean flour have a significant effect on the preference score test for the aroma of fried chicken flour. To find out that there are differences in the treatment of variations in the substitution of koro sword bean, it can be seen in the graph of the relationship between drying temperature and substitution of koro sword bean flour is in Figure 5.

![Graph of the relationship between drying temperature and flour substitution on the favourite score test for the aroma of fried chicken flour seasoning.](image)

Figure 5 Graph of the relationship between drying temperature and flour substitution on the favourite score test for the aroma of fried chicken flour seasoning.
Based figure 5. shows the drying temperature of koro sword bean does not affect the panellists’ preference for aroma. This is because the drying temperature of 60 ° C-80 ° C has not been able to get rid of the unpleasant smell of fried chicken which causes the panellists’ assessment of the aroma of fried chicken to not have much difference.

The percentage increase in the concentration of koro sword bean flour has an effect on the preference for fried chicken aroma. This is because the higher the percentage of the concentration of koro sword bean flour causes the aroma of fried chicken to be more preferred due to the distinctive smell of koro sword bean.

3.3.3. The preference of taste

The favorite organoleptic test of the taste of fried chicken seasoning from koro sword bean is a parameter of panelists’ assessment to determine consumer acceptance of the taste preferences of food products. To determine the effect of the treatment on the favourite score test for the taste of the fried chicken flour seasoning, then a diversity analysis was carried out. From the analysis of diversity, it can be seen that the drying temperature of the beans has a significant effect on the taste preferences of fried chicken seasoning, while the variation in the substitution of koro sword bean has no effect. To find out the difference between treatments, which is presented in the graph of the relationship between drying temperature and substitution of koro sword bean flour is shown in Figure 6.

Based on Table1 and Figure 6, the drying temperature of the koro sword bean had a significant effect on the preference for the taste of fried chicken flour. The taste at a drying temperature of 60 ° C was the most preferred by panellists due to the savoury taste of the fried chicken produced. At 60 ° C, there is no browning.

Figure 6. Graph of the relationship between drying temperature and flour substitution on the taste preferences of fried chicken flour.

The percentage of adding peanut flour does not effect because of the resulting fried chicken taste. This is because the flavour of fried chicken produced by koro sword bean flour is not much different so that the panellists find it difficult to distinguish it.

4. Conclusion

Based on the results of the analysis of HCN, moisture content, and organoleptic tests on fried chicken flour substituted with koro sword bean flour, it can be concluded as follows:

1. The variation in drying temperature of koro sword bean flour has an effect on cyanide acid (HCN) levels and taste preferences but does not affect the colour preferences of the fried chicken flour.
2. The variation of the addition of koro sword bean flour has an effect on the preference for aroma but does not affect the preference for the colour of the fried chicken seasoning flour.
3. The best-fried chicken seasoning flour was obtained at a drying temperature of 80°C with an HCN content of 29.73%, the amount of added 20% koro sword bean flour was able to produce fried chicken seasoning flour with 36.50% HCN.

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