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Article

Chemical and Sensory Properties of Instant Coffee from Argopuro Regency

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Abstract: Instant coffee was one of diversification product from ground coffee. This product was popular and consumed by many people because of the reason liked easily to make, more efficient, didn't have pulp and soluble in water. The study aims to determine chemical properties and quality sensor of instant coffee from Argopuro regency. Co- crystallization was the method that used to make coffee instant product. The crystallization agent that commonly used is sucrose from sugar. The process occurred when the sucrose concentration in the solution was at a super saturated level, it would make coating compound molecules in the form of crystal nuclei and grew into larger component. This study used a Randomized Complete Design with two factors. First factor was concentration ground coffee (10%, 30%), and the next one was concentration of sugar (80%, 90%, and 100%). The observation parameters included rendement, moisture content, ash content, and sensory properties. The result was suspected that chemical properties did show significant effect and the best result from important attributed taste was shown by 30% ground coffee concentration and 100% sugar concentration.

Keywords: Coffee Instant; Crystallization; Sensory quality; Sugar

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1. Introduction

Coffee is also one of the leading commodities in Jember district which has extraordinary agricultural potential, and is currently the second coffee centre in East Java with Robusta coffee which has a high selling value on the international market [1]. Politeknik Negeri Jember have many Teaching Factory (Tefa). Tefa is called mini factory that produced like industrial thing. One of them is Tefa Coffee Processing. One of the products that have been produced by Tefa Coffee Processing was ground coffee Robusta from Argopuro regency, so to add innovation to other coffee products so that they are varied and follow the tastes of consumers from various circles, namely by making products in the form of instant coffee. According to previous research, researchers conducted related fermentation times to produce new flavour profiles to support the green beans produced as raw material for ground coffee at Tefa Coffee Processing [2]. Instant coffee was one of diversification product from ground coffee [3]. Instant coffee was invented of the early twentieth century and immediately this product played important role because of convenience when prepared [4]. This product was popular and consumed by many people because of the reason liked easily to make, more efficient, didn't have pulp and soluble in water

The principle of making instant coffee made coffee using the process of concentrating the coffee brew (extract) which is then dried [5]. Co- crystallization was the method that used to make coffee instant product. The crystallization agent that commonly used is sucrose from sugar. The process occurred when the sucrose concentration in the solution was at a super saturated level, it would make coating compound molecules in the form of crystal nuclei and grew into larger component [6]. The study aims to determine chemical and sensory properties of instant coffee from Argopuro regency.

2. Materials and Methods

2.1 Raw materials and reagents

Coffee beans of Robusta variety were purchased from a local vendor in Argopuro regency. That product was processed by natural process. Chemicals such as sugar, aquadest, and mineral water.

2.2 Production of Instant Coffee

Roasted coffee beans was roasted at a medium to dark roast level. The roaster machine was set with an initial temperature of 190ºC. Roasting was carried out for 10 – 15 minutes. Roasted beans were rested for 24 hours before grinded. The coffee ground was packaged on aluminum foil packaging. Coffee grounds dissolved with distilled water at a temperature of 90˚C with a ratio (10% and 30%). Extraction was done in 24 hours. Coffee extraction that obtained from the last process was cooked until boiling, the next step was added sugar with concentration (80%, 90% and 100%) until super saturated. The process occurred when the sucrose concentration in the solution was at a super saturated level, it would make coating compound molecules in the form of crystal nuclei and grew into larger component. [7].

2.3 Rendement

Rendement was measured by comparing amount weight of coffee instant produced with the coffee powder. The result of the rendement was calculated in percentage units [6].

2.4. Chemical Properties

2.4.1 Moisture content. According to [8] 2g of the sample A was weighed in a weighing dish (W1). The weighed sample was transferred to the oven and dried for 30 minutes. The dried sample was again weighed to obtain consistence results (W2). The percentage moisture content was then determined from;

$$\% \text{ Moisture} = \frac{(W1-W2)}{W} X100\%$$

2.4.2 Ash content. The ash content of the samples was measured according to the AOAC method. The ash content was calculated as follows [8].

$$\% \text{ Ash content} = \frac{(W2-W1)}{W} X100\%$$

2.5 Sensory Properties

Samples for sensory evaluation were prepared for 6 treatments from different combinations of concentration of ground coffee and sugar that were used to prepare the instant coffee. 1 gr of each instant was mixed with 15 mL water and served to 30 semi trained panelists. Each preparation was given a random code and panelists were judge 6 different samples in a 1-5 scale with 3 attributes, namely taste, aroma and color [9].

2.6 Research design

The experimental design that *used* was a completely randomized completed design with 2 factors. The first factor was concentration of ground coffee (K) that consisted of two levels namely 10% (K1) and 30% (K2). The other factor was concentration of sugar namely 80%, 90%, and 100% with three times repetitions. Data that was obtained from this research will be analyzed by ANOVA to get the treatment effect, if there are significant differences will be continued with DMRT test at a significant level at 5%.

Table 1. Result Design for Instant Coffee

Ground coffee Concentration	Sugar concentration (%)		
(%)	80 (S1)	90 (S2)	100 (S3)
10% (K1)	K1S1	K1S2	K1S3
30% (K2)	K2S1	K2S2	K2S3

3. Results and Discussion

After analyzing the data, the value of is obtained:

Table 2. Results of Observation Recapitulation based on further tests

Treatment	Rendement (%)	Moisture content (%)	Ash content (%)
K1S1	45,68a±0,18	2,59b±0,06	7,15bc±0,24
K1S2	48,84b±1,64	3,00c±0,005	6,75ab±0,24
K1S3	52,23c±0,64	2,30a±0,02	8,35d±0,60
K2S1	48,30b±0,58	3,61d±0,05	7,80cd±0,14
K2S2	49,89b±0,445	3,88e±0,10	6,17a±0,67
K2S3	61,47d±0,93	3,91e±0,12	9,39e±0,19

3.1 Rendement

In the industrial world, the content of materials that can be produced from the processing technology of a material (here in after referred to as rendement) needs to be recorded. Data on rendement is useful in economic calculations due to waste of the production, so we had to maximized rendement for minimized the waste [10]. Based on the figure 1 rendement of the instant coffee showed that there was significant difference between sampel K1S1 than others, it showed there were significant influenced by addition the concentration sugar and ground coffee. Based on the table 2 the highest rendement of final product was K2S3 61,47%.

3.2 Moisture Content

Moisture content explained the amount of free water in instant coffee product.[11]. This component was important factors that determined quality of instant coffee. The result of moisture content was shown in table 2. Based on the table 2 moisture content of the instant coffee showed that there was significant difference between one sample to the others. It showed there were significant influenced by addition the concentration sugar and ground coffee. The ranged of moisture content were 2,30% to 3,91%. The highest moisture content was 3,91% and it still ranged to requirement of SNI instant coffee that claimed maximum of water contain was 4%.

3.3 Ash Content

Total ash content was explained as the leftover inorganic components after the combustion process. This is due to the fact that organic matter decomposes into carbon dioxide gas (CO_2) and water (H_2O) [12]. Based on the table 2 ash content of the instant coffee showed that there was significant difference between one sample to the others. The ranged of ash content were 6,17% to 9,39%. According SNI 2983:2014 ash content of final product was still within the range, namely 6-14%.

3.4 Sensory Properties

Table 3. Results of Sensory Properties

Treatment	Color	Aroma	Taste
K1S1	2,10a	2,57b	2,40b
K1S2	2,90b	1,23a	2,57b
K1S3	2,87b	3,03c	1,50a
K2S1	2,93b	2,90bc	2,73b
K2S2	3,33b	4,57d	3,47c
K2S3	2,23a	2,93bc	4,77d

Hedonic test was described as preference as liking test. The purposed of this test was for making panelist to choose on option over other candidate samples. This test was used to verify the consumer preference liked or disliked [13]. The hedonic test was called the preference (liking) test. The hedonic test was asking the panelists to have to choose one option over the other product. The result of sensory properties was shown in table 2. Based on the table 2 sensory properties there were 3 attributes in final product that used to evaluate for namely taste, color and aroma.

According to table 3 in color attribute overall there was not significant difference in panelis preference. This attribute influenced of many things, one of all was affected by color of roasted bean. The result of roasted bean dependent on the roasting profile. The longer and high temperature that used to give darker to the beans due to maillard reaction that produces volatile compounds, the caramelization of carbohydrates, and the formation of CO_2 [14]. On the other hand, the result that was not significant different also duo to range of ground coffee concentration. It needed more added and wider range

The other attributes were aroma. Aroma was first attribute that was detected by panelis [15] The ranged sensory quality in aroma attribute was 2,10 to 3,33. There were significant difference data on aroma attribute, namely sample KIS2 to others, but there was not significant difference in others liked in K1S3 to K2S1 and K2S3. The difference result might be temperature at processing. High temperature gave significantly impact to all active compound that made aroma in coffee. The heating temperatures during crystallization was possible decrease the aroma ini final product, instant coffee. [16]. The taste was important attribute that determined result product. Based on the table 3 explained the best taste attribute got 4,77 poin, from scale 1-5, namely sample K2S3. It described the addition maximum of highest concentration of sugar and ground coffee got best preference to 30 panelis. The 30% ground coffee and 100% sugar was suited perfectly with consumer taste. Overall the distribution of liking data for all of the attribute was showed at figure 1 Sensory Profile of Instant Coffee.

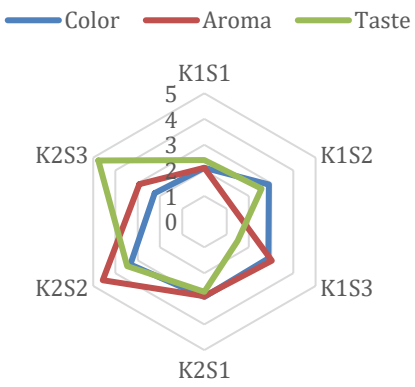

Figure 1. Sensory Profile of Instant Coffee

4. Conclusions

The chemical properties liked moisture content, rendement and ash content did show significant effect. The result of chemical properties liked moisture content and ash content were included in SNI requirements. Sensory quality of the instant coffee through three attributes namely color, taste and aroma give significant impact. The best result from important attributes for this product, taste showed that sample K2S3 which had highest concentration of sugar and ground coffee was perfectly suited to consumer preference.

Author Contributions:

Conceptualization, E Rosdiana, R N Kusumaningtyas and D. G Pratita; methodology, E Rosdiana, R N Kusumaningtyas and D. G Pratita; validation, E Rosdiana, R N Kusumaningtyas and D. G Pratita; formal analysis, E Rosdiana and R N Kusumaningtyas; investigation, E Rosdiana, R N Kusumaningtyas and D. G Pratita; resources, E Rosdiana, R N Kusumaningtyas and D. G Pratita; data curation, E Rosdiana, R N Kusumaningtyas and D. G Pratita; writing—original draft preparation, E Rosdiana, R N Kusumaningtyas and D. G Pratita; writing—review and editing, E Rosdiana, R N Kusumaningtyas and D. G Pratita.

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