The effect of different non-dairy creamer on ready-to-drink milk coffee

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Abstract. Milk coffee is greatly favourable instant-coffee among societies as the demand for it is considerably high as it mostly serves blended flavours. RTD (ready-to-drink) milk coffee is one of coffee drink that provide practical value to consumers. Creamer is one of important ingredient used in RTD-milk coffee. Every creamer has different properties which affect the final taste and mouthfeel of the products. This current study was aimed to investigate the effect of non-dairy creamer on sensory profile of RTD-milk coffee. The sensory profile was studied by the JAR (Just-About-Right) method involving 40 respondents. Protein, fat, and total soluble solids as well as viscosity and colour analysis were also assessed. Based on Principal Component Analysis on physical and chemical properties as well as sensory profile, it can be concluded that all non-dairy creamer tested in this study are not sufficiently able to replace the dairy creamer due to their higher fat content (p-value <0.05). Nonetheless, the FM878 is selected among non-dairy creamer as added ingredient for RTD-milk coffee based on JAR analysis.

1. Introduction
Coffee happens to become one of the most favourable beverages among societies in Indonesia due to its distinctive flavour properties. Some countries, including Indonesia, have been developing instant coffee considering its practical perspective. In the former times, instant or RTD (ready-to-drink) coffee had only been dominated by the original (black coffee) variant. However, it recently presents with more diverse variants such as cappuccino, latte, moccacino, milk coffee, caramel coffee, vanilla coffee, etc [1]. Milk coffee is a highly preferred instant coffee and considered the most popular among consumers.

Creamer is frequently used as an additive in making instant coffee to add up lining flavour variations. A derived creamer product is non-dairy creamer that comprises of oil-in-water emulsion [2]. Some beneficial values are offered by non-dairy creamer such as lower price, more durable, easy to store, distribution, and handling convenience. Different compositions in creamer contribute to the varied properties as well as affect the produced taste and mouthfeel [3].

Producing RTD milk coffee using different non-dairy creamer is potential to develop. Hence, proximate analysis including analysis of protein, fat, total soluble solids, viscosity, and colour, are highly required in order to identify the components of RTD milk coffee which uses different non-dairy creamer. One of the sensory methods to be applied is JAR (Just-About-Right) using a direct approach to consumers toward levelling the ideal properties, ranging from too low, too high, and adequately "Just
about Right”, in a particular product [4]. The aim of this study was to investigate the effect of non-dairy creamer on sensory profile of RTD milk coffee.

2. Materials and methods

2.1 Materials
Materials used in this study consisted of water, non-dairy creamer, skim milk powder, coffee, sugar, salt, and stabilizer. The chemicals used in this study included sulphuric acid 91-92%, amyl alcohol, sulphuric acid, a mixture of Na2SO4 and HgO, K2SO4, 45% NaOH, and palate cleanser for sensory evaluation.

2.2 Methods
Completely Randomized Block Design was performed in this study to observe different types of non-dairy creamer which was set in 4 replications. Chemical and physical assessments in this study were carried out on six coded samples of RTD milk coffee (M510, M580, M820, M830, FM878, 35C) and one of the commercial dairy creamer (Carnation). Chemical analysis was based on fat analysis (Geber method), protein analysis (Kjeldahl method), total soluble solids analysis (refractometer), and physical viscosity analysis (viscometer) also colour testing using a colour reader. This study required 40 non-trained panellists for sensory evaluation. The panellists were then asked to score the samples for JAR and hedonic tests based on their preference.

3. Results and discussion

3.1 The effect of different non-dairy creamer on physico-chemical properties of RTD milk coffee
As it can be seen in Table 1, different non-dairy creamer applications show a significant change on protein and fat content, the total soluble solids, viscosity and colour measurement (α = 0.05). The more vegetable oil was added, the protein content was also lower [5]. The highest total soluble solids value was FM878 (16.38°Brix) and the lowest was M510 (14.55°Brix.). The total soluble solids represent sugar content in a material [6]. The highest viscosity value was observed for sample M510 (45.6 cP) while the lowest was M580 (13.7 cP). In general, the M510 was observed to be most superior considering its viscosity and colour parameters.

3.2 Sensory evaluation
In order to conduct penalty analysis, the consumers’ overall preference levels and JAR attributes ratings are required. The penalties were plotted opposingly against the percentage of the respondents. The mean drops were calculated for the “too high” and “too little” levels. The mean drops represent the number of liking points that were lost for having a product “too high” or “too little” for a consumer [7]. The penalty is a weighted difference between the means. The attributes that impact 20% or more of respondents and cause a drop of 1 point or more are included in the critical corner. A critical corner is normally set to highlight those attributes that are having the biggest negative impact on liking.

Table 2 presents penalty analysis values on each attribute in both levels: “too high” and “too little” that are valued by panellists. According to penalty analysis data, the attribute of sample M510 shows a significant penalty result, although the mean drop of the “too high” level on creamy flavour shows a significant effect (α = 0.05). This is due to the level of “too low” scored less than 20%, so that the overall penalty is not significant. The analysis penalty used an absolute threshold (threshold) of 20% shows the minimum limit of consumer percentages in assessing the intensity of attributes and to describe the product characteristics at the ideal level [8].

As shown in Table 2, the FM878 was rated as the best creamer that meet consumer expectation even compared to the commercial dairy creamer. This type of creamer is the most superior in terms of protein content among the product tested. However, considering the Principal Component Analysis as shown on Figure 1, all non-dairy creamer except the M510 are grouped within the same cluster. This suggest
that most of the tested non-dairy creamer is still acceptable except the M510. This may be attributed by the fact that the M510 has the highest viscosity among the creamer tested.

Figure 1. Principal component analysis for dairy (dash-line circle) and non-dairy creamer (solid line circle) on ready to drink milk coffee

Table 1. Physico-chemical properties of RTD milk coffee

| Creamer code | Average Protein Content (%) | Average Fat Content (%) | Average Total Soluble Solids (°Brix) | Average Viscosity (cP) | Colour L* | Colour a* | Colour b* |
|--------------|----------------------------|-------------------------|--------------------------------------|------------------------|-----------|----------|----------|
| M510         | 1.42 ± 0.05                | 1.59 ± 0.25             | 14.55 ± 0.18                        | 45.60 ± 4.80           | 47.33 ± 3.94 | 10.67 ± 1.30 | 30.86 ± 1.54 |
| M580         | 1.40 ± 0.05                | 1.48 ± 0.05             | 15.91 ± 0.25                        | 13.70 ± 0.81           | 50.89 ± 9.35 | 9.35 ± 0.25 | 28.77 ± 0.61 |
| M820         | 1.59 ± 0.07                | 1.58 ± 0.24             | 15.64 ± 0.31                        | 17.62 ± 1.14           | 51.85 ± 1.94 | 8.77 ± 0.19 | 27.76 ± 0.42 |
| M830         | 1.44 ± 0.07                | 1.95 ± 0.21             | 15.63 ± 0.70                        | 19.91 ± 1.14           | 55.36 ± 8.61 | 8.61 ± 0.28 | 28.17 ± 0.58 |
| FM878        | 1.86 ± 0.20                | 1.43 ± 0.04             | 16.38 ± 0.70                        | 17.59 ± 1.14           | 53.15 ± 8.82 | 8.82 ± 0.28 | 28.15 ± 0.58 |
| 35C          | 1.42 ± 0.10                | 1.55 ± 0.12             | 15.83 ± 0.37                        | 18.08 ± 1.21           | 52.61 ± 8.94 | 8.94 ± 0.27 | 27.94 ± 0.47 |
| Carnation   | 1.34 ± 0.05                | 0.98 ± 0.16             | 14.91 ± 0.16                        | 16.01 ± 1.14           | 41.56 ± 9.20 | 9.20 ± 0.25 | 25.40 ± 0.85 |

Notes: Data mean ± standard deviation (n=4). Different notation showed a significant difference (α<0.05)
Table 2. Penalty analysis of RTD milk coffee

| Creamer code | Brown colour | Sweet aroma | Coffee aroma | Creamer aroma | Sweet taste | Bitter taste | Creamy flavour | Milky flavour | Mouth-feel |
|--------------|--------------|-------------|--------------|---------------|-------------|--------------|----------------|--------------|------------|
| M510         | JAR          | JAR         | JAR          | JAR           | -           | JAR          | TH*            | JAR          | JAR        |
| M580         | TH/TL        | TL*/TH*     | TL*          | JAR           | TH          | JAR          | JAR*/TH*       | JAR          | JAR        |
| M820         | JAR          | JAR         | TL*          | JAR           | TH          | TL*          | JAR*/TH*       | JAR          | JAR        |
| M830         | -            | JAR         | JAR          | JAR           | -           | JAR          | JAR*/TH*       | JAR          | JAR        |
| FM878        | JAR          | JAR         | JAR          | JAR           | TH*         | JAR          | JAR*/TH*       | JAR          | JAR        |
| 35C          | JAR          | JAR         | TH*          | TH*           | JAR         | TH*          | TH*            | JAR          | JAR        |
| Carnation    | -            | JAR         | JAR          | JAR           | JAR         | JAR          | JAR*/TH*       | JAR          | JAR        |

Notes:
- The results were collected from 40 consumer respondents
- TH = Too High, TL = Too Little, JAR = Just About Right
- The asterisk (*) shows the significant mean drop for non-JAR categories
- The minus (-) shows the unspecified data

4. Conclusions
Based on Principal Component Analysis, all the non-dairy creamer is still not sufficiently matched with the commercial dairy creamer, even though the fat content of non-dairy creamer is more superior to the dairy one. There are at least 2 groups of non-dairy creamer, in which it may be contributed by the significant different in viscosity (p-value<0.05). Among the non-dairy creamer tested, the FM878 was selected as it fulfilled the consumer expectation based on JAR analysis.

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