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CHARACTERISTICS OF SWEET POTATO INSTANT CREAM SOUP FOR EMERGENCY FOOD

[Karakteristik Sup Krim Ubi Jalar Instan untuk Pangan Darurat]

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ABSTRACT

A convenient food such as instant cream soup is most suitable for practical lifestyle but can also be applied in an emergency situation such as in area affected by disasters. The addition of milk powder as the main ingredient of cream soup creates a complex binding of fat and starch that complicates the rehydration process and affects other physical appearances. This research aimed to obtain the appropriate concentration of full cream milk powder to obtain the best physical and chemical characteristics and the most preferable instant cream soup of dried sweet potato. The research method used was a randomized block design with six variables and two repetitions. Instant cream soup with 20% full cream milk powder gave the best physical and chemical characteristics and organoleptically preferred by panelists. The physical and chemical characteristics of the most preferred soup had 6% water content, 95.47% rehydration power, 18% protein, 20.7% fat, 1080 cP viscosity, and 30.5% yield. This formula was likened by panelists for its taste, aroma, color, and thickness after rehydration.

Keywords: dried sweet potato puree, full cream milk powder, instant cream soup

ABSTRAK

Makanan yang mudah untuk digunakan seperti sup krim instan menjadi pilihan yang paling tepat bagi mereka yang lebih memilih kepraktisan serta dapat diaplikaskan pada kondisi darurat seperti pada daerah terdampak bencana. Penambahan susu bubuk full krim pada krim sup akan menghasilkan ikatan kompleks antara lemak dan pati yang menyulitkan proses rehidrasi serta berpengaruh pada penampakan fisiknya. Tujuan penelitian adalah untuk memperoleh konsentrasi susu bubuk full krim yang tepat pada pembuatan sup krim instan ubi jalar kering sehingga mempunyai karakteristik fisik dan kimia terbaik dan disukai panelis. Metode yang digunakan pada penelitian ini adalah rancangan acak kelompok dengan enam perlakuan dan dua ulangan. Krim sup instan dengan konsentrasi 20% susu bubuk full krim memberikan karakteristik fisik dan kimia yang terbaik serta secara organoleptik disukai oleh panelis. Karakteristik fisik dan kimia menunjukkan sup krim instan memiliki kadar air 6%, daya rehidrasi 95,47%, kadar protein 18%, kadar lemak 20,7%, viskositas 1080 cP dan rendemen 30,5% serta kesukaan panelis terhadap rasa, aroma, warna dan kekentalan setelah direhidrasi dapat disukai

Kata kunci: *pure ubi jalar kering, sup krim instan, susu bubuk full krim*

INTRODUCTION

Breakfast contributing in carbohydrate, protein, fat and energy intake which holds most of the main nerves function. However, the rapid activity in today's lifestyle tends to make people skipping their breakfast which holds important roles in daily needs. A ready-to eat and ready-to use food becoming the most suitable choice for people who like being practical. More than that, a ready-to eat and ready-to use food also offers an easy utilization for people who are affected in a disaster area particularly children of 4-6 years old age. One of the products is instant cream soup. Instant cream soup is a food product made of flour with the addition of other food ingredients which can be easily prepared by just adding hot water. It is designed to be fast and simple in its preparation and also to fulfill the nutrition need especially for those affected by disaster.

Most of wheat flour, corn starch, broth and full cream milk are the main ingredient of cream soup. The making of cream soup can also be modified by using other material other than wheat flour or corn starch. Dried sweet potato can be used as cream soup main ingredient because it contains amylo-

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graph properties and having peak viscosity that appropriate for wet product such as instant cream soup (Sunyoto *et al*., 2016). Dried sweet potato used in this research was the superior product of sweet potato developed at Padjadjaran University (Clone *Awachy* 5). Dried sweet potato is lack in nutrition and taste. *Awachy* 5 sweet potato contain 90.88% carbohydrate, 1.89% fat, 0.76% ash and 1.76% protein. Based on its nutrition composition, it needs to add certain ingredients to increase the nutrient and palatability of dried sweet potato puree especially when it is to be consumed as an instant cream soup.

The lack of nutrient such as protein and fat in dried sweet potato used in instant cream soup can be increased by adding other ingredient such as full cream milk powder. Full cream milk powder made of standard milk with fat content 26-29% and protein 25-27% (Visentin *et al.,* 2017). By adding full cream milk powder, it is expected that the produced cream soup will fulfill the criteria of emergency food product. Emergency food must meet certain nutritional value such as containing at least 15% protein content and 18% fat content. Findings suggest that food pantry clients prefer to receive meat/poultry/fish, vegetables, and fruit over soda, candy, and snack foods which higher in nutrients (Hudson *et al.,* 2011).

The addition of full cream milk powder on mixed cream soup will affect physical properties such as colour, aroma, taste, texture, viscosity and on the overall performance of the resulted cream soup. Full cream milk powder will also influence the texture of instant cream soup after being rehydrated by hot water. The more the full cream milk powder added, the lower the ability of instant cream soup to absorb water during the rehydration process, so that the expected viscosity cannot be obtained (Sunyoto and Futiawati, 2012). Those are the main reasons on why the addition of full cream milk powder should be given in the appropriate amount/concentration so that the physical appearance of instant cream soup will resemble other similar product especially the commercial cream soup. Therefore, this research will determine the appropriate concentration of full cream milk powder in the making of instant cream soup of sweet potato, having the best physical and chemical characteristics and the most preference by panelist to be utilized as an emergency food product.

MATERIALS AND METHODS

Materials

Materials used in this research were sweet potato of *Awachy* 5 Clone harvested in Cikarawang, Bogor at 4.5 months of age, beef bought from Gedebage Traditional Market, distilled water (PT. Amidis Tirta Mulia), corn oil (PT. Pan Pacific Development Jakarta), salt (PT. Susanti Megah), sugar (PT. Sweet Indolampung), pepper and garlic powder (PT. Ganesha Abadilama (Mitra Sambal).

Methods

The main experiment was aimed to determine the best concentration of full cream milk powder (PT. Indolakto Jakarta) added on the making of instant cream soup based on sweet potato puree. Steps on the making of sweet potato puree instant cream soup were, first by making the sweet potato puree which is modified by annealing (Sunyoto *et al.*, 2016). After having cleaned, sweet potato was sliced with maximum width 2 cm then soaked in water at 50°C for 4 hours for the annealing modification. Next, sweet potato was steamed twice to gelatinize the starch and soften its texture to make it into shape of puree. Sweet potato puree then dried in blower oven (RAD1-42 benchtop oven) at 60°C for 20 hours. The used of high temperature here was meant for the annealing process where it could enhance starch crystalline due to the change in starch structure (Sun *et al.,* 2013). Flakes of dried sweet potato then milled and sieved using 80 mesh tyler sieve. Second, beef broth was made by boiling beef in water with 1:1 ratio at 90°C for 60 minutes. The resulting broth was then cooled to room temperature and then filtered to separate the impurities. Formulation of the instant cream soup could be seen on Table 1. In addition, a solution of the mixture of full cream milk powder and broth with full cream milk powder concentrations of 12.5, 15, 17.5, 20, 22.5 and 25% was prepared (Table 1).

Table 1. Formulations of sweet potato puree instant cream soup

Ingredients (g)	Treatments					
	A	B	C	D	E	F
Beef broth	787.5	765	742.5	720	697.5	675
Full cream milk powder	112.5	135	157.5	180	202.5	225
Dried sweet potato puree	80	80	80	80	80	80
Corn oil	27	27	27	27	27	27
Sugar	8.46	8.46	8.46	8.46	8.46	8.46
Salt	10.8	10.8	10.8	10.8	10.8	10.8
Pepper	0.27	0.27	0.27	0.27	0.27	0.27
Garlic powder	0.27	0.27	0.27	0.27	0.27	0.27

The next step was to mix all ingredients and was cooked (Rinnai Gas Stove RI-522C) until the temperature of 80°C reached while stirring it throughly till homogenous. Sweet potato cream soup then was dried by using blower oven (RAD1-42 benchtop oven) at 50°C temperature for 48 hours. Dried cream soup then milled and sieved using 60 mesh tyler sieved (ASTM E11-13 Compliance Sieve).

Method used in this research was conducted with randomized block designed, consisted of six treatments and twice repetition. The treatments of the addition of full cream milk powder consists of: Treatment A= 12.5% (w/w); Treatment B= 15.0% (w/w); Treatment C= 17.5% (w/w); Treatment D: 20.0% (w/w); Treatment E= 22.5% (w/w) and Treatment F= 25.0% (w/w). Chemical properties observed were water content by gravimetric method (AOAC, 2005), fat content by soxhlet method (AOAC, 2005) and protein content by micro-kjeldahl method (AOAC, 2005). Physical properties observed were rendement (AOAC, 2005), rehydration power by adsorption method (Krokida, 2003) and viscosity using rotational viscometer RP1. Organoleptic test was conducted by using hedonic test against color, aroma, taste and thickness preference of cream soup after rehydrated (Fuller, 2016). Supporting observation was carried out to the best instant cream soup of the selected treatments, identified by its effectiveness index (Sigmarsdottir *et al*., 2013). Supporting observation was conducted on the best instant cream soup, to calculate protein adequacy rate for kids. Scanning electron microscope was also used to identify its particle image.

RESULTS AND DISCUSSION

Chemical characteristic

Chemical characteristic determination was conducted based on three parameters, water content, fat and protein content. The results of chemical analysis showed the information about nutritional facts and the product's composition. The estimation of nutritional value on the product can determine proteins, fat and moisture content which indicated the product suitability to be applied as emergency food product (Table 2).

Water content

Analysis result shows (Table 2) that there is a significant different on water content of instant cream soup caused by the addition of full cream milk powder. Treatment A (12.5%) has no significant differrent with treatment B (15.0%), C (17.5%) and D (20.0%) but is significant different with treatment E (22.5%) and F (25.0%).

It is showed that treatment A (12.5%) up to D (20.0%) did not give a significant different on instant cream soup's water content and starts giving significant effect from treatment E (22.5%). Statistical result shows that 22.5% full cream milk powder concentration was the treatment that can lower the water content of sweet potato puree instant cream soup significantly.

The lower the water content of instant cream soup as the higher the concentration given caused by the initial water content of the mixture. The higher the concentration of full cream milk powder the lesser the amount of beef broth where the treatment itself is the comparison of full cream milk powder with the beef broth (Table 1). So that when it was dried at the same temperature and time, cream soup mixture with the lower initial water will have the lower water content as well. Dried product with water content less than 10% in this case is instant cream soup will better at keeping the quality also and is suitable for emergency situation.

The decreasing of water content as the higher the full cream milk powder was given shows that, the treatment itself gave a specific effect on instant cream soup's water content. Fat and protein as component of full cream milk powder inhibit the ability of starch in absorbing water to initiate the pasting process for starch tend to absorb fat and protein better. The hampered of pasting process caused the surface water is excessive so the water content is measured lower. The water content of instant cream soup's has met the standard for instant cream soup with maximal 8% (w/b) (Sunyoto and Futiawati, 2012). The low values of water content on high fat product can relate on the high lipid oxidation rates while between a_w values of 0.2 and 0.4, lipids have been suggested to have optimal stability and oxidetion rates increase again with increasing a_w (Raitio *et al.,* 2011).

Table 2. Chemical characteristic of instant cream soup

Criteria	Water Content (% w/b)	Fat Content (% w/b)	Protein Content (% w/b)
Formula A; 12.5%	6.50±0.80^{a}	17.90±0.42^{a}	15.29±0.21^{a}
Formula B; 15.0%	6.38±0.83^{ab}	19.72±0.11^{b}	15.72±0.02^{a}
Formula C; 17.5%	6.19±0.66^{ab}	20.15±0.56^{bc}	16.48±0.47^{b}
Formula D; 20.0%	6.09±0.78^{ab}	20.30±0.23^{cd}	18.10±0.26^{c}
Formula E; 22.5%	5.79±0.61^{b}	21.08±0.38^{de}	18.33±0.22^{cd}
Formula F; 25.5%	5.11±0.13^{c}	21.51±0.56^{e}	18.98±0.12^{d}

Note: Results signed with the same alphabet shows no significant different at α = 5% according to Duncan test

Fat content

Results on Table 2 show that the addition of full cream milk powder gave a significant different on fat content of instant cream soup. Treatment A (12.5%) gave a significant influence on the other treatment. The results indicate that the increasing of full cream milk powder from 12.5% to 15.0% based on statistic test, gave a significant different effect and will give the same effect on the treatment C (17.5%) if the addition of full cream milk powder is at least 10.0%.

The increasing of fat content is the contribution from the treatment itself whereas the fat content in full cream milk powder are at least 26% (Marie *et al.,* 2007). Fat contained on a food product has an important role because it can determine the texture of a product and it can be absorbed longer in stomach that gives a longer full feeling. Fat also essential in inducing consumer's appetite (Paul and Breslin, 2013). Fat content of instant cream soup has met the standard given for emergency food product with a minimum of 18.0% (Clugston, 2016) except for the treatment A with only 17.9% of fat content.

Protein content

Results on Table 2 shows that there is a significant different on water content of instant cream soup caused by the addition of full cream milk powder. Treatment A (12.5%) in Table 2, did not give a significant influence compared to treatment B (15.0%) but it gave significant different effect on the other treatment. The statistic test shows that the addition of 2.50% full cream milk powder concentration could not give a significant influence on the increasing protein content. The increasing of protein content started to show a significant influence at the addition of 17.5% concentration of full cream milk powder.

The higher the full cream milk powder added, the higher the protein content of instant cream soup. The addition of full cream milk powder was aimed to fix the lack of protein in sweet potato puree when it is applied as a product. Milk powder is known as an important source of protein for adults and children and containing 24% protein (Ye *et al.,* 2016). The protein content in all treatment has met the criteria of emergency food product with a minimum of 7-9 g protein per 50 g serving or equal to 15% protein (Clugston, 2016). Protein content becomes important because the emergency food product should meet the nutrition that needed for children in a disaster impacted area.

Physical properties

Physical properties were evaluated to check the product's claimed as instant product during the rehydration and after the rehydration. Physical characteristic of instant cream soup was evaluated on its rehydration rate, viscosity and its yield shown in Table 3.

Rehydration rate

Determining the rehydration rate of food products is substantial in order to prepare for the consumption. Reconstituting the dried food will show several properties of food in order to be accepted by consumer such as acceptable textural, visual and sensory characteristic meanwhile the rehydration time is minimized (Jokić *et al.,* 2009).

Based on Table 3, there is a significant difference on rehydration rate of instant cream soup caused by the addition of full cream milk powder. Table 3 shows that treatment A (12.5%) did not give a significant different on treatment B (15.0%) but giving significant different with the other treatment (17.5; 20.0; 22.5; 25.0%). Statistical test indicates that up to 15.0% of full cream milk powder concentration still gives a significant different on the rehydration rate and start affecting at 17.5% of full cream milk powder concentration.

The higher the concentration of full cream milk powder, the lower the rehydration rate of the instant cream soup. The lower rehydration rate shows that the ability of instant cream soup in adsorbing water is also low. The contribution of fat from full cream milk powder will create a layer on the surface of starch granule. This layer will inhibit the starch in absorbing water when it is being wetted (Ravindran *et al.*, 2009). Powder material with higher rehydration power is easier to be homogenized. During rehydration, the amounts of water absorbed with further rehydration were minimal until equilibrium was attained, which signaled the maximum water capacity (Vazquez *et al.*, 2015).

Table 3. Physical characteristic of instant cream soup

Criteria	Rehydration rate (%)	Viscosity (cP)	Rendement (%)
Formula A; 12.5%	109.69±0.12^{a}	2380.00±77.78^{a}	23.71±0.21^{a}
Formula B; 15.0%	107.08±0.55^{a}	2240.00±169.70^{a}	25.61±0.28^{b}
Formula C; 17.5%	101.03±0.27^{b}	1411.00±192.33^{c}	27.71±0.62^{c}
Formula D; 20.0%	95.47±0.11^{c}	1080.25±63.28^{bc}	30.53±0.48^{d}
Formula E; 22.5%	90.45±0.17^{d}	1044.25±27.22^{b}	32.72±0.14^{e}
Formula F; 25.5%	88.38±0.03^{d}	621.25±115.61^{a}	34.28±0.96^{f}

Note: Results signed with the same alphabet shows no significant different at α= 5% according to Duncan test

Viscosity

Rheological behavior such as viscosity is important for controlling quality and process in food produce. Viscosity itself is valuable properties of liquid food in processing food (Amal *et al.,* 2014). Based on the results on Table 3, there is a significant different on viscosity of instant cream soup caused by the addition of full cream milk powder.

Based on the statistical test (Table 3), treatment E (22.5%) gave a significant influence on the treatment F (25.0%), C (17.5%), B (15.0%) and A (12.5%) but did not imply a significant effect on treatment D (20.0%). The significant difference which is showed in treatment C (17.5%) indicates that the decreasing of cream soup's viscosity as the addition of full cream milk powder is higher. It is caused by the higher the fat content on instant cream soup as the higher the full cream milk powder given. Starch form sweet potato puree will create a complex bound of fat-amylose with full cream milk powder which slower the absorbing of water (Sunyoto and Futiawati, 2012). In soup making, viscosity is an index of thickness (Ikegwu *et al.,* 2009). So that, the amount of water which can be held by starch will be lesser and the viscosity will be measured lower.

Yield

The yield was determined by dividing the weight of the instant cream soup that passing through 60 mesh sieving (final weight) with the total weight required to make the soup cream (initial weight). Yield is calculated by the formula:

$$\% \text{ Yield} = \frac{\text{Final weight (g)}}{\text{Initial weight (g)}} \times 100$$

Based on the results (Table 3), it shows that there is a significant different on the yield of instant cream soup caused by the addition of full cream milk powder.

Based on the statistic test, the increasing of full cream milk powder will give a very significant effect on rendement properties. It indicates that with only 2.50% of full cream milk powder is added, can give a significant effect on the increasing of instant cream soup's yield. Total solid in full cream milk powder itself is 96% which contributed the most to the yield (Marie *et al., 2007)*. Yield can indicate the economic value of a product. On a powdered product, a high amount of the yield still cannot guarantee the economic value of itself because it also depends on the swelling volume when the powder is being rehydrated. In addition to that, they are ready for reconstitution in a short time (Sudarsan *et al.,* 2017).

Organoleptic properties

Organoleptic test was conducted to determine the acceptability of food. It is useful in product improvement, quality maintenance and more important in a new product development (Singh-Ackbarali and Maharaj, 2014). Based on the results on Table 4, there is no significant different effect on colour preference of instant cream soup caused by the addition of full cream milk powder.

Color preference

Non-significant different on colour preference of instant cream soup (Table 4) indicates that it was hard to determine the difference assumed by panelist, to give the same score on each treatment. Panelist average result on all treatment was translated into the desiring preferences. The colors of instant cream soup by adding hot water on its serving gave a yellowish color. The resulted color derived from Maillard reaction between lactose and protein on full cream milk powder. The cooking and drying process induced the Maillard reaction or non-enzymatic reaction stimulated by the existence of temperature rising which resulted in a yellow-brownish color from melanoidin pigmen (Guan *et al.,* 2017).

Aroma preference

Data on Table 4 shows that there is no significant different on aroma preference of instant cream soup caused by the added of full cream milk powder. Statistic test results a non-significant difference on aroma preference caused by the high concentration of full cream milk powder. The result indicates that panelist were not able to distinguish the aroma of instant cream soup by adding hot water. Full cream milk powder given as treatment has very sharp aroma that even in the given lowest concentration is scored the same as other treatment.

Table 4. Organoleptic properties of instant cream soup

Organoleptic Properties	Color Preference	Aroma Preference	Flavor Preference	Thickness Preference
Formula A; 12.5%	3.12±0.08^{a}	3.53±0.08^{a}	2.55±0.04^{a}	3.44±0.21^{bcd}
Formula B; 15.0%	3.09±0.12^{a}	3.44±0.12^{a}	3.03±0.54^{b}	3.29±0.03^{bc}
Formula C; 17.5%	3.29±0.17^{a}	3.47±0.08^{a}	3.30±0.16^{bcd}	2.94±0.33^{b}
Formula D; 20.0%	3.41±0.08^{a}	3.55±0.54^{a}	3.97±0.04^{e}	3.65±0.02^{e}
Formula E; 22.5%	3.53±0.25^{a}	3.43±0.53^{a}	3.44±0.28^{cd}	3.41±0.16^{bcd}
Formula F; 25.5%	3.38±0.12^{a}	3.53±0.41^{a}	3.21±0.29^{bc}	2.65±0.33^{a}

Note: Results signed with the same alphabet (a, b, c, d) shows no significant different at α= 5% according to Duncan test, scoring that used in organoleptic tests: Score 1= do not like; 2= do not like it much; 3= rather like; 4= like; 5= really like

The aroma was the result of Maillard reaction that creates different aroma, smelled by panelist which is the reaction between reducing sugar and primary amine group (Guan *et al.,* 2017).

Flavor preference

Results on Table 4 shows that there is a significant different on flavor preference of instant cream soup caused by the addition of full cream milk powder.

Flavor is the main properties that determine consumer's acceptance on a product. Statistic test show that treatment A (12.5%) has the lowest score among all other treatments. Treatment D (20.0%) most likely to be the most desired with the highest preference score. Based on the hedonic test, treatment D (20.0%) resulted in the best formulation among other treatment in producing the sweet potato puree instant cream soup. Flavor which appear is the combination between lactose of full cream milk powder, with sweetness ranging from 15-20% compared to the sweetness of sucrose. Other than that, spices given as ingredient also contributing in creating savory taste in the instant cream soup by adding hot water.

Thickness preference

Data on Table 4 shows that there is a significant different effect on thickness preference of instant cream soup caused by the addition of full cream milk powder.

Based on statistic test, treatment A (12.5%), B (15.0%), C (17.5%) and D (22.5%) did not give significant different on the thickness preference. Treatment D (20.0%) gave the best preference score and shows a significant different than other treatment. Based on the hedonic test, treatment D (20.0%) was the treatment that most likely to be desired by panelist. The viscosity of cream soup on treatment D (20.0%) is 1080.25 cP (Table 3) and cream soup F (25.0%) with the lowest score is 621.25 cP (Table 3). The test indicates that the lower the viscosity, the lower the preference of panelist.

Effective treatment

Selecting treatment was defined using effectiveness index. This method arranges every variable in each treatment and weight them based on its priority from 0-1 (Sigmarsdottir *et al*., 2013). The calculation involved could determine which treatment with the biggest score and settled as the chosen treatment. Based on the calculation it is indicated that treatment D with 20.0% full cream milk powder concentration gave the biggest score. Treatment D eliminates the other treatment for its organoleptic properties and some physical appearances such as viscosity and rehydration power.

Protein adequacy rate calculation

Nutrient adequacy rate can be useful to set consumption planning and as a basis to prescribe nutrition label. If lack of nutrient ever happened to our body, especially protein, at the first stage will cause hunger and soon will cause a lost of weight followed by the reduction of productivity (Shinta, 2010). The proper serving size of cream soup can be distinguished from the recommended dietary allowances especially for kids 4-6 ages in Indonesia (Table 5).

Based on Table 5 the recommendation amount of protein that must be fulfilled through breakfast is 30% of a day which equal to 12 g of protein that must be supplied. Protein content of instant cream soup has been determined from the analysis result in Table 4. Instant cream soup with the best characteristic was instant cream soup with treatment D, determined by effectiveness index (Sigmarsdottir *et al*., 2013).

Based on Table 5, it should be at least 12 g of protein supplied to fulfill the protein need for breakfast. Table 6 shows the recommended serving size for instant cream soup. It can be distinguished that 75 g of serving size can meet the need for protein based on Recommended Protein Allowances for Kids. Serving size recommendation for sweet potato puree instant cream soup is 75 g based on the protein recommendation.

In 75 g of instant cream soup serving known that it possibly met the need of 30% protein a day, measured for kids. Further than its high nutrition content, instant cream soup also offered a long shelf life and is suitable to be applied in disaster impacted area. Dried soup powders have an advantage of protection from enzymatic and oxidative spoilage and flavor stability at room temperature over long periods of time (Farzana *et al.,* 2017).

Table 5. Recommended Protein Allowances for Kids in 2012

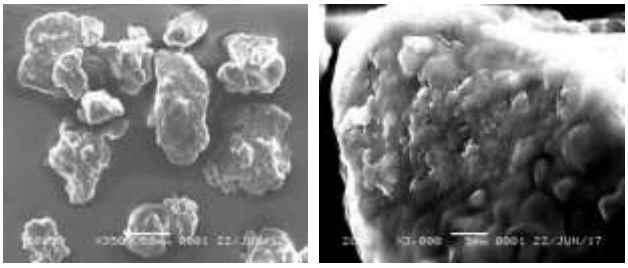
Age	Protein Adequate Rate per Day (g/day)	Protein Needed by Breakfast (%)	Amount of Protein must be Supplied/Serving (g)
Kids 4-6 years old	40	30	12 ± 1.2 (30% x 40 gr)

Table 6. Recommended Serving Size for Instant Cream Soup

The Best Instant Cream Soup (D)	Protein per Serving Size 100 g	Protein per Serving Size 75 g	Protein per Serving Size 50 g
20.0% Full cream milk powder	18.10	13.575	9.05

Morphology of cream soup's powder

Physical analysis using the scanning electron microscopy was carried out on the surface of sweet potato puree instant cream soup with the best characteristic (Treatment D) to study the morphology of cream soup's powder (Figure 1).



A B

Figure 1. SEM Analysis Results on Instant Cream Soup with The Best Characteristic (Treatment D) x 350 magnitude

Figure 1 shows a rough surface of the sweet potato puree instant cream soup particle. From Figure 1 (a), through 350 x magnitude can be seen the overall image of instant cream soup's particle. Zooming was conducted when necessary to see the tinier figure on the surface of the particles. The rough look was created by the fat layer, bound around the starch (b). The complex bound between amylose and fat slower the pasting process, which affects the physical properties such as viscosity and rehydration power. In Figure 1 could be seen some pores appear which more likely indicated the porosity of an instant product. The porous that only few appeared, shows the pasting process was not occurred perfectly due to the existence of fat and protein instead of swelling water. Porous food indicated it that has a lot of pores that will facilitate and speed up rehydration, so the more pores exist the faster it is when rehydrated (Hao *et al.,* 2016).

CONCLUSION

Based on the results, it can be concluded that significant influence of added full cream milk powder concentration has occurred on the physical, chemical and organoleptic properties of instant cream soup such as rehydration power, viscosity, yield, water content, protein content, fat content, flavor preference and thickness preference. However, the concentration of full cream milk powder did not give a significant influence on some organoleptic properties such as color preference and aroma preference.

Instant cream soup with the best characteristic was Treatment D (12.5% of full cream milk powder concentration) indicated by its effectiveness index. Sweet potato puree instant cream soup with the best characteristic has 6.09% water content (w/b), 95.47% rehydration power, 18.10% protein content, 20.7% fat content, 30,87% yield, 1080.25 cP viscosity and the panelists preferences were flavor, aroma, colour and thickness after having been rehydrated.

REFERENCES

Amal MH, Abdel-Haleem, Omran AA. 2014. Preparation of dried vegetarian soup supplemented with some legumes. Food Nutr Sci 5: 2274-2285. DOI: 10.4236/fns.2014.522241.

[AOAC] Association of Official Analytical Chemists. 2005. Official Methods of Analysis 18th Edition. Association of Analytical Chemist, Washington DC.

Clugston GA. 2016. Food and nutrition needs in emergencies-World Health Organization. https://www.who.int/nutrition/publications/en/nut_needs_emergencies_text.pdf [Accessed: January 2016]

Farzana T, Mohajan S, Trissa H, Hossain MN, Haque MZ. 2017. Formulation and nutritional evaluation of a healthy vegetable soup powder supplemented with soy flour, mushroom, and moringa leaf. Food Sci Nutr 5: 911-920. DOI: 10.1002/fsn3.476.

Fuller GW. 2016. New Food Product Development, from Concept to Market Place. 3rd Edition. 237-272. CRC Press. Boca Raton, USA

Guan YG, Wang SL, Yu SJ, Yu SM, Zhao ZG. 2017. Changes in the initial stages of a glucose-proline Maillard reaction model system influences dairy product quality during thermal processing. J Dairy Sci 95: 590-601. DOI: 10.3168/jds.2011-4860.

Hao JH, Chen Q, Hu K. 2016. Porosity distribution optimization of insulation materials by the variational method. Int J Heat Mass Transfer 92: 1-7. DOI: 10.1016/j.ijheatmasstransfer.2015.08.076.

Hudson H, Webb K, Crawford PB. 2011. Food preferences of users of the emergency food system. J Hunger Environ Nutrition 6: 179-187. DOI: 10.1080/19320248.2011.576589

Ikegwu OJ, Oledinma NU, Nwobasi VN, Alaka IC. 2009. Effect of processing time and some additives on the apparent viscosity of 'achi' *brachystegia eurycoma* flour. J Food Technol 7: 34-37

Jokić S, Mujić I, Martinov M, Velić D, Bilić M, Lukinac J. 2009. Influence of drying procedure on colour and rehydration characteristic of wild asparagus. Czech J Food Sci 27: 171-177.

Krokida MK, Marinos-Kouris D. 2003. Rehydration kinetics of dehydrated products. J Food Eng 57: 1-7. DOI: 10.1016/S0260-8774(02)00214-5.

Marie LV, Romain J, Christelle L, Pierre S. 2007. Free fat, surface fat and dairy powders: interactions between process and product. A review. Dairy Sci Technol 87: 187-236.

Paul AS, Breslin. 2013. An Evolutionary Perspective on Food and Human Taste. Curr Biol 23: 409-418. DOI: 10.1016/j.cub.2013.04.010.

Raitio R, Orlien V, Skibsted LH. 2011. Storage stability of cauliflower soup powder: The effect of lipid oxidation and protein degradation reactions. Food Chem 128: 371-379. DOI: 10.1016/j.foodchem.2011.03.038

Ravindran G, Matia-Merino L. 2009. Starch-fenugreek (*Trigonella foenum-graecum* L.) polysaccharide interactions in pure and soup systems. Food Hydrocolloid 23: 1047-1053. DOI: 10.1016/j.foodhyd.2008.08.010

Shinta A. 2010. The identification of nutrient adequacy and family nutrient escalation strategic in probolinggo. J Sepa 7: 1-5.

Sigmarsdottir M, De Garmo D, Forgatch MS, Gudmundsdottir E. 2013. Treatment effectiveness of PMTO for children's behavior problems in Iceland: Assessing parenting practices in a randomized controlled trial. Scand J Psycol 54: 468-476. DOI: 10.1111/sjop.12078.

Singh-Ackbarali D, Maharaj R. 2014. Sensory evaluation as a tool in determining acceptability of innovative products developed by undergraduate students in food science and technology at the university of Trinidad and Tobago. J Curric Teaching 3: 10-27. DOI: 10.5430/jct.v3n1p10.

Sudarsan SM, Santhanam SG, Visalachi V. 2017. Development and formulation of instant soup mix from sprouted horse gram and radish leaves. Int J Home Sci 3: 346-349.

Sun Q, Wang T, Xiong L, Zhao Y. 2013. The effect of heat moisture treatment on physicochemical properties of early indica rice. Food Chem 141: 853-857. DOI: 10.1016/j.foodchem.2013.03.077.

Sunyoto M, Andoyo R, H. Radiani. Rista. N. 2016. Characteristic of dried sweet potato puree with temperature and annealing time treatment as preparation for emergency food. N J Sci Tech 6: 1-10.

Sunyoto M, Futiawati R. 2012. The influence of full cream milk powder concentrationon the characteristics of “Rasi” instant cream soup. J Agr Sci Tech 2: 1218-1231.

Vazquez JAR, Ulloa JA, Ulloa PR, Ramírez JCR. 2015. Effect of dehydration conditions on the chemical, physical, and rehydration properties of instant whole bean (*Phaseolus vulgaris* L. var. Azufrado). J Chem 2015: 1-11 DOI: 10.1155/2015/131357.

Visentin G, McParland S, De Marchi M, McDermott A, Fenelon MA, Penasa M, Berry DP. 2017. Processing characteristic of dairy cow milk is moderately heritable. J Dairy Sci 100: 6343-6355. DOI: 10.3168/jds.2017-12642.

Ye MP, Zhou R, Shi YR, Chen HC, Du Y. 2016. Effects of heating on the secondary structure of proteins in milk powders using mid-infrared spectroscopy. J Dairy Sci 100: 89-95. DOI: 10.3168/jds.2016-11443.