Physicochemical and Sensory of Cookies from Composite Flour (Wheat and Pumpkin Flour) and Different Types of Stabilizers

Mimi Nurminah[1,2], Rona J. Nainggolan[1]
[1]*Department of Food Science and Technology, Faculty of Agrculture, Universitas Sumatera Utara, Medan, Indonesia*
[2]*Centre for Tuber and Roots Crop Study, Faculty of Agriculture, University of North Sumatera*

Keywords: cookies, stabilizer, wheat flour, pumpkin flour

Abstract: One bakery products that is often consumed in Indonesia is cookies, especially during religious holidays such as Eid Mubarak, the demand for cookies increases, so the demand for wheat flour will increase by around 5-10 percent, so import wheat flour will increase too. In an effort to improve Indonesian food security, research is needed on food from local resources, like pumpkin to subtitute wheat flour on bakery products. This research deal about the physicochemical and sensory of cookies from composite flour (wheat and pumpkin flour) and different types of stabilizers. The pumpkin flour can subtitute wheat flour about 20-40% to make cookies.

1 INTRODUCTION

Diversification of food from local food is needed to achieve food security. When we want to decrease the amount of imported flour from other countries, we must be active in finding and researching plants in Indonesia to be used as a source of ingredients for flour making which can replace imported flour such as wheat flour (Marsigit, 2010). In 2017-2018, Indonesian wheat imports are predicted to reach 9.7 million tons, up 0.7 percent from 2016-2017 which reached 9 million tons (Food and Agriculture Organization, 2017). Indonesia

Cookies are usually made from flour, eggs, and sugar. To obtain better quality cookies, a stabilizer can be added. Stabilizers are materials that are commonly used for food or non-food industry. The use of stabilizers aims to improve texture, as a thickener, emulsion stabilizer or fat, water and air molecule binder, so that it will improve the dough structure so that product quality will be maintained and can last longer (Hartatik and Damak, 2017). Indonesia is an agricultural country with abundant natural resources and has a diversity of local food in the form of 77 types of carbohydrates, 75 types of sources of fat or oil, 26 types of beans, 389 types of fruits, 228 types of vegetables, 40 types of drinks, and 110 types of spices (Suli, 2016). Local food that can be used as a source of carbohydrates other than rice are pumpkin, cassava, sweet potato, banana, corn, breadfruit, canna, sago, taro, gadung, suweg, gembili and others.

Wheat import always increase in Indonesia, it means that a high demand for food products derived from wheat flour. Development flour from local food can make a lower on wheat import from other countries (Mojiono et al, 2016). One way to use pumpkin is to be processed into pumpkin flour. This pumpkin flour can then be used in making several kinds of food products or as food ingredients to substitute wheat flour in a variety of making bread, cakes and pastries. The use of pumpkin can support food diversification efforts for Indonesian people (Puput, 2018). Pumpkin flour is flour with fine grains, passes the 60 mesh sieve with a moisture content of about 13%. The physical condition of pumpkin flour is influenced by the condition of the base material and the drying temperature carried out. The level of maturity of pumpkin influences the sugar content in it. The higher the content of pumpkin sugar will make the flour produced will clot and smell of caramel if the drying temperature used is too high (Hendrasty, 2003).

Hydrocolloids are heterogeneous long-chain polymers that have the properties to form thick and / or gel dispersions when dispersed in water. With the presence of many hydroxyl groups can increase the affinity to bind water molecules and make them into

Nurminah, M. and Nainggolan, R.
Physicochemical and Sensory of Cookies from Composite Flour (Wheat and Pumpkin Flour) and Different Types of Stabilizers.
DOI: 10.5220/0008547901470151
In *Proceedings of the International Conference on Natural Resources and Technology (ICONART 2019)*, pages 147-151
ISBN: 978-989-758-404-6

hydrophilic compounds. Then a dispersion is formed which is an intermediate between solution and suspension and colloid is formed. Because these two properties are called hydrocolloids (Saha and Bhattacharya, 2010). Hydrocolloids in food products have functions as adhesives, water binders, emulsifiers, gel formers and thickener, besides that they can also reduce the free water content in food ingredients. Hydrocolloid interacts with charged macromolecules such as proteins so that it can produce gel formation. This molecule forms a double helix bond that binds the chain into three dimensions (Widyaningtyas and Susanto, 2015)

2 MATERIAL AND METHOD

This research was conducted at Analisa Kimia Bahan Pangan Laboratory, University of North Sumatera. Pumpkins were purchased from farmer at Kecamatan Saribudolok, kabupaten Simalungun, Indonesia. The making of pumpkin flour: the pumpkin was peeled with 0.2 cm thick sliced knife, placed in a baking sheet and dried in an oven with temperature 50^{o}C about 24 hours, then milled and sifted with 80 mesh sieve. The making of cookies: Mixed composite flour (pumpkin and sweat flour) with formulation 80%:20%; 60%:40%; 40%:60%, and 20:80% with total treatment about 100 gr. Mixer sugar 20%, salt 0,2%, egg 14%, 50% margarine until swelling, added 5 treatment of composite flour with 4 stabilizer (non stabilizer, arab gum, CMC, and Tween 20). Kneaded about 25 minutes with hand, make the dough in a circle and dried in the oven at 160^{o}C about 25 minutes. Analysis consist of moisture content analyis by using oven method (AOAC, 1995), ash content using dry ashing method (Sudarmadji et al., 1997), betacarotene content (Apriyantono et al, 1989), sensory test (Soekarto, 1982).

The data analysis using randomized design were analyzed using SPSS version 22 for windows. The results reported in all tables are average of triplicate observation subjected to one way analysis of variance (ANNOVA). Different among the ranges of the properties were determinate using the method of Least Significant Differences (LSD) tests at 95% confidence level (P<0.01). The best treatment was then compared with the control treatment T-test De Garmo was used in determining the best treatment method.

3 THE EFFECT COMPARISON OF WHEAT AND PUMPKIN FLOUR ON PHYSICOCHEMICAL OF COOKIES

Tabel 1: Effect of comparison of wheat and pumpkin flour on moisture content

Wheat flour:pumpkin flour	Moisture Content
T1 = 80:20	4.770
T2 = 60:40	4.740
T3 = 40:60	4.630
T4 = 20:80	4.490

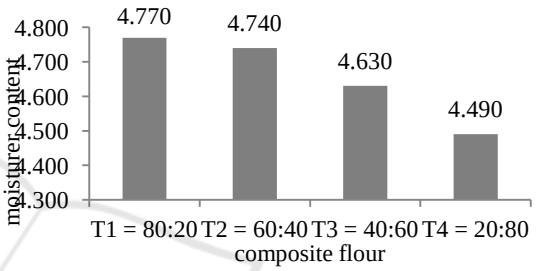

Figure 1: Effect of comparison of wheat and pumpkin flour on moisture content

Table 1 and figure 1 showed that the moisture contain of cookies are 4.490 until 4.770. This our cookies had moisture content lower than SNI 01-2973-1992 (quality requirements for cookies in Indonesia). This coookies has met the requirements in moisture content, because in SNI the maximum value moisture content is 5. When the moisture content of cookies is little, storage time of these cookies will be maintained longer because microbial growth can be inhibited, the water needed for microbes can grow and develop is not enough for microbial needs.

The comparison of flour with pumpkin flour which is getting higher results in higher water content. Pumpkin flour contains relatively higher starch and fiber than wheat flour. The higher starch and fiber content in the material absorbs more water (Nurani et al., 2014).

Tabel 2: Effect of comparison of wheat and pumpkin flour on ash content

Wheat flour:pumpkin flour	Ash Content
T1 = 80:20	0,700
T2 = 60:40	1,290
T3 = 40:60	2,060
T4 = 20:80	2,660

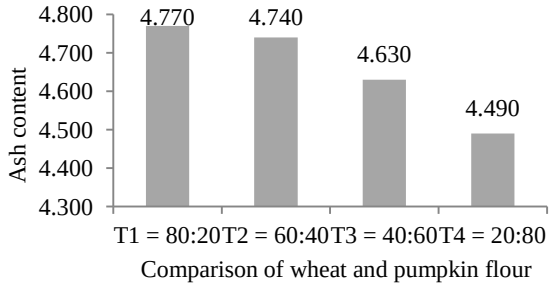

Figure 2: Effect of comparison of wheat and pumpkin flour on ash content

Table 2 and figure 2 showed that the ash contain of cookies are 0.700 until 2.660. From the table dan figure, it can be seen that the more pumpkin flour added, the more ash content of the cookies produced. The level of flour ash according to SNI 3751 in 2009 was 0.7% while the ash content of pumpkin flour was 6.1629% (Handayani, 2018). When we saw the amount of ash content, actually we saw the rate of of minerals or organic substances in foodstuffs that are not flammable and evaporate during spawning (Ratnasari dan Yunianta, 2015).

Tabel 3: Effect of comparison of wheat and pumpkin flour on betacarotene content

Wheat flour:pumpkin flour	Betacarotene Content
T1 = 80:20	1.310
T2 = 60:40	1.990
T3 = 40:60	3.410
T4 = 20:80	4.840

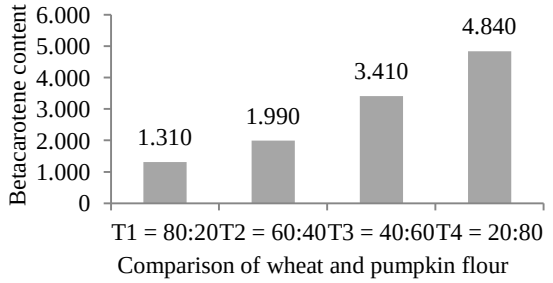

Figure 3. Effect of comparison of wheat and pumpkin flour on betacarotene content

Table 3 and figure showed that betacarotene of cookies are 1.310 until 4.840. The more pumpkin flour that is added, there was increasing of the number of betacarotene cookies produced. this is caused by pumpkin containing high amounts of betacarotene in the amount of 1000-1300 IU / 100 gr ingredients (Hendrasty, 2003).

4 EFFECT THE DIFFERENT TYPES OF STABILIZERS ON PHYSICOCHEMICAL OF COOKIES

Table 4 and figure 4 showed effect of different types of stabilizers on ash content. The amount of ash content about 1.600 until 1750. Level the ash content of cookies using a stabilizer higher than not using a stabilizer. This showed stabilizer can bind minerals.

Tabel 4. Effect of the different types of stabilizers ash content

Stabilizers	Ash Content
P1 = Non Stabilizer	1.600b
P2 = Gum Arab	1.660ab
P3 = CMC	1.700ab
P4 = Tween 20	1.750a

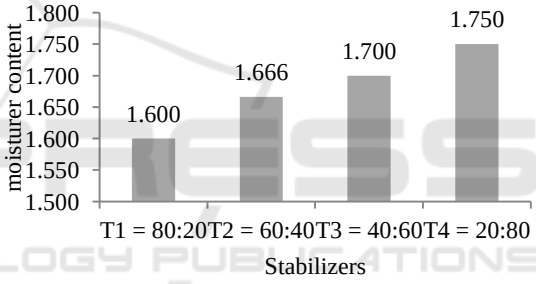

Figure 4. Effect of the different types of stabilizers on ash content

Table 5 and figure 5 showed effect of different types of stabilizers on betacarotene content. The amount of betacarotene content about 1.310 until 4.840. The use of stabilizers in making cookies is able to increase the value of betacarotene compared to not using a stabilizer. With high betacarotene values, cookies will have more added value than cookies that are only made from wheat flour. Stabilizer is a material used to improve the texture, thickener, emulsion stabilizer or fat, water and air molecule binder. Stabilizers improve the dough structure so that product quality will be maintained and can last longer (Hartatik and Damat, 2017). CMC is an emulsifying agent, stabilizer and thickener which is often used to increase the stability of food product emulsions so that there is no separation between the dispersed phase and the dispersing phase if the product is stored for a long time. In CMC food products it functions to improve the texture, prevent crystallization of sugar in candy

products and prevent starch retrogradation in affected products (Nugroho, 2007). The structure of arabic gum contains arabinogalactant chains that bind to proteins to form protein arabinogalactant (AGP). The structure of arabinogalaktan serves to produce a solution with low viscosity while the protein part which acts as a good emulsifier (Wustenberg, 2015).

Tabel 5: Effect of the different types of stabilizers on betacarotene content

Stabilizers	Betacarotene Content
P1 = No Stabilizer	1.310
P2 = Gum Arab	1.990
P3 = CMC	3.410
P4 = Tween 20	4.840

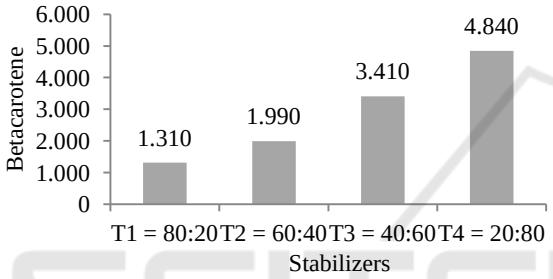

Figure 5: Effect of the different types of stabilizers on betacarotene content

5 EFFECT COMPARISON OF WHEAT AND PUMPKIN FLOUR ON SENSORY OF COOKIES

From table 6 and figure 6 it can be seen that the more pumpkin flour added, the lower the flavor value. Pumpkin flour color has distinctive flavor, which is unpleasant.

Tabel 6: Effect of comparison of wheat and pumpkin flour on flavor content

Wheat flour:pumpkin flour	Flavor Content
T1 = 80:20	3.340a
T2 = 60:40	3.320b
T3 = 40:60	3.080c
T4 = 20:80	2.900d

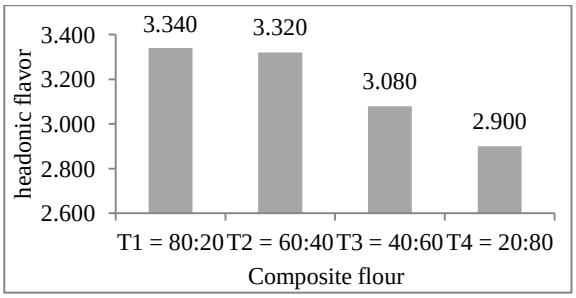

Figure 6: Effect of comparison of wheat and pumpkin flour on flavor content

From Table 7 and Figure 7 it can be seen that the more pumpkin flour added, the lower the taste value. Pumpkin flour color has distinctive taste, which is unpleasant. Taste is a response to chemical stimuli that reach the taste buds of the tongue, especially the basic types of taste, namely sweet, sour, salty and btter (Meilgaard et al., 2000). Research on the making of snack bars from substitute pumpkin flour will cause the taste to be unpleasant and less favored by panelists (Handayani, 2018).

Tabel 7: Effect of comparison of wheat and pumpkin flour on taste content

Wheat flour:pumpkin flour	Taste Content
T1 = 80:20	3.290a
T2 = 60:40	3.180b
T3 = 40:60	2.960c
T4 = 20:80	2.250d

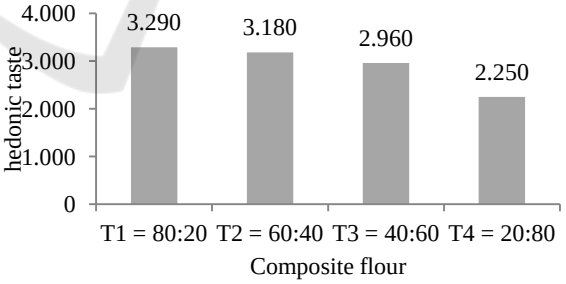

Figure 7: Effect of comparison of wheat and pumpkin flour on taste content

6 CONCLUSION

The pumpkin flour can subtitute wheat flour about 20-40% to make cookies.

REFERENCES

AOAC. 1995. *Official methods of analysis of the association of analytical chemists*. Washington D.C.

Apriyantono, A., D. Fardiaz, N.L. Puspitasari, Sedarnawati dan S. Budiyanto, 1989. Analisis Pangan. *IPB Press*. Bogor.

Badan Standarisasi Nasional. 1992. The pastry. SNI 01-2973-1992. Jakarta.

Badan Standarisasi Nasional. 2009. Wheat Flour. SNI. 375:2009. Jakarta.

Food and Agriculture Organization. 2017. *Food Outlook Biannual Report on Global Food Markets*. FAO.

Hartatik, T. D. Dan Damat, 2017. Effect of addition of cmc stabilizers and arabic gum on the characteristics of functional cookies from modified garut starch.

Hendrasty, H.K. 2003. *Yellow Pumpkin Flour Manufacture and Utilization*. Kanisius. Jakarta.

Marsigit, W. 2010. Development of diversification of Bengkulu local food products to support sustainable food security. *Jurnal AGRITECH*. 30 (4): 256-264.

Meilgaard, M., G. V. Civille, B. T. Carr. 2000. Sensory evaluation techniques. *CRC-Press*, Boca Raton. Florida.

Mojiono, Nurtama, B., and Budijanto, S. 2016. Development of gluten free noodles with extrusion technology. *Jurnal PANGAN*. 25(2): 125-136.

Nugroho, 2007. Carbohydrate in food industry. http:nugrohob.wordpress.com

Nurani, S dan S.S. Yuwono, 2014. Utilization of kimpul flour (*Xanthosoma sagittifolium* as cookies material (case ratio of flour and margarine). *Jurnal pangan dan Agroindustri*. 2(2): 50-58.

Handayani, Puput., 2018. Effect of comparison of pumpkin flour, mocaf flour and kidney beans by adding egg yolks to the quality of the snack bar. .*Undergraduate thesis*. Faculty of Agriculture. Universitas Sumatera Utara. Indonesia.

Hendrasty, H.K. 2003. Yellow Pumkin: Procesing and Utilization.. Kanisius. Jakarta.

Saha, D., and S. Bhattacharya. 2010. Hydrocolloids as thickening and gelling agents in food: a critical review. *J. Food Sci Technol*. 47 (6): 587-597.

Suli, 2016. MP3L and self-sufficiency and local food sustainability. Tabloid Sinartani. Jakarta.

Soekarto, S.T. 1982. Organoleptic assessment for the food and agricultural products industry. *Pusbangtepa IPB*. Bogor.

Sudarmadji, S., B. Haryono dan Suhardi. 1989. Analysis procedure for food ingredients. Liberty. Yogyakarta. Indonesia.

Widyaningtyas, M. Dan W. H. Susanto. 2015. Effect of hydrocolloid type and concentration (carboxy methyl cellulose, xanthan gum and carrageenan) on the characteristics of dried noodles based on sweet potato paste yellow ase varieties. *Jurnal pangan dan agroindustri*. 3(2): 417-423.

Wustenberg, T. 2015. *General Overview of Food Hydrocolloids. Cellulose and Cellulose Derivatives in the Food Industry: Fundamentals and Application* First Edition. Wiley-VCH Verlag GmbH & Co. KgaA.