

EFFECT OF AMYLOSE CONTENT AND TEMPERING TIME ON CHARACTERISTICS OF FRESH RICE FLOUR- BASED SPRING ROLL WRAPPERS

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EFFECT OF AMYLOSE CONTENT AND TEMPERING TIME ON CHARACTERISTICS OF FRESH RICE FLOUR-BASED SPRING ROLL WRAPPERS

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ABSTRACT

The effects of amylose content and tempering time on characteristics of fresh rice flour-based spring roll wrappers were investigated by using added free amylose of cassava to rice flour. The used rice flour in this research was from variety Mentik (an Indonesian local rice variety). Amylose content of blended rice flour ranged from 25% up to 40%. The fresh rice flour-based spring roll wrappers were made without frying oil on Teflon frying pan at 72°C during 4 minutes. After heating, the product was tempered for 30, 45 and 60 minutes at 25°C. The product was evaluated for rice starch granules size, moisture content, water activity and elongation at break. Each experiment was conducted by three replications. All of the data were analyzed by analysis of variance (α 5%). Duncan multiple range test (α 5%) was used to determine the significant difference among the treatments. The result showed that free amylose adding to rice flour blends homogenized the swelling of rice starch granules. The increasing of amylose content more than 34% increased water activity. The amylose content from 31 % up to 40% increased the moisture content but tempering time from 30 up to 60 minutes did not affect moisture content and elongation significantly. Increasing amylose content decreased elongation at break.

Keywords: amylose content, tempering time, fresh spring roll, rice flour, characteristics.

INTRODUCTION

Tempering time of fresh spring roll wrapper is a given time to the product after heating until it can be removed from the frying-pan at room temperature. In cooling process still occur water vapor evaporation and water migration through the system slowly (Anonymous, 2007). During the process of heating and tempering occur evaporation of water to produce solid matter which is a group of polymers of inter-connected polymer chains (Andersen et al., 2000). This change resulted in drop of temperature and provided the product was in rubbery state and then became the glassy state (Moraru and Kokini, 2003). In these conditions the product will become more cohesive and it could be removed from the frying-pan easily.

Starches with higher amylose content will form stronger gel and will be more difficult to damage. Increasing of amylose content will inhibit the swelling of the granules thus maintained the integrity of the swollen starch granules. Too short tempering time will produce a sticky product which is related to high amount of surface water as a result of insufficient water migration from the surface to interior parts of the product. In contrary long tempering time will dehydrate the product (Anonymous, 2007). Longer time of tempering may increase the alignment of free amylose molecules and starch crystallization which lead to decrease of water binding ability of the system. It resulted in increasing of free water molecules that make increasing Aw (Yao et al., 2003). The purpose of this study is to investigate the influence of amylose content and tempering time on the characteristics of fresh rice flour-based spring roll wrappers.

MATERIALS AND METHODS

Materials. Mentik rice from Candi, Nglames, Madiun, obtained from the UD. Eka Jaya rice mill, Surabaya. Rice flour obtained by grinding the rice in dry process (without

soaking) and sifted with a 80 mesh sieve size. Amylose extraction from tapioca used modified method of Takeda et al. (1986) and Patindol et al. (2003). Leghorn chicken eggs obtained from a local shop in Surabaya.

Methods. The research design was factorial experiment with randomized completely block design. Various factors is the amylose content consists of six levels, namely: 25%; 28%; 31%; 34% ; 37% and 40% (w / w); while tempering time with three levels of factors (30, 45 and 60 minutes) at 25°C. The observed dependent variables are starch granule size, a_w , moisture content and elongation at break. The data were processed by analysis of variance, the difference of among treatments were tested by Duncan Multiple Range Test with $\alpha = 5\%$. Starch granules size was measured by using Olympus DP 20 Digital Camera Microscope. Water activity was measured with a Rotronic hygrometer AW1 Hygro Palm at 85% RH + / - 1% at temperature of 25 ° C + /-2 ° C. Moisture content was measured by gravimetric method (AOAC, 2000). Elongation at break was measured by Shimadzu Autograph. The batter has been mixed to be homogeneous by placing the mixture on a magnetic stirrer with a speed of 100 rpm for 2 minutes, then placed on a Teflon material frying pan (diameter 10 cm). Heating was held at 72 ° C for 4 minutes.

Table 1. Formula of Fresh Rice flour-based Spring Roll Wrapper

Ingredients (g)	Amylose Content (%)					
	25	28	31	34	37	40
Rice Flour	3.00	2.85	2.70	2.55	2.40	2.25
Crude amylose of 85% purity*	0.00	0.15	0.30	0.45	0.60	0.75
White Egg	3.50	3.50	3.50	3.50	3.50	3.50
Water	6.00	6.00	6.00	6.00	6.00	6.00
Tapioca	0.50	0.50	0.50	0.50	0.50	0.50
Total (g)	13.00	13.00	13.00	13.00	13.00	13.00

RESULTS AND DISCUSSION

Rice Starch granules size

Data in Table 2. showed a significant difference in the effects of amylose content and there was interaction between two factors to the size of rice starch granules.

Table 2. Rice Starch Granule Size of Fresh Rice Flour-based Spring Roll Wrappers on Different Levels of Amylose and Tempering Time

Tempering Time (minutes)	Rice Starch Granule Size (μm^2)*					
	Amylose Content (%)					
	25	28	31	34	37	40
30	1596.59 h	1531.39 ef	1476.12 d	1408.92 c	1323.34b	1271.57 a
45	1568.19 g	1515.53 e	1470.49 d	1403.02 c	1321.74b	1261.59a
60	1539.75 f	1512.84 e	1468.43 d	1402.06 c	1321.91b	1260.12a
DMRT 5%	18.23 - 20.51					

*Values in same column with different letter are significantly different based on DMRT test with $\alpha = 5\%$

It also showed that starch granules size decreased significantly with increasing amylose content on tempering time for 30, 45 and 60 minutes.

Water activity (a_w)

Data showed a trend of increasing in a_w as levels of amylose increasing. This phenomena could be influenced by amylose alignment molecules, the freed water molecules will lead increasing of a_w .

Table 3. A_w of Fresh Rice Flour-based Spring Roll Wrappers on Different Levels of Amylose

Amylose Content (%)	a_w *
25	0.516 a
28	0.518 a
31	0.521 a
34	0.524 ab
37	0.529 b
40	0.539 c
DMRT 5%	0.0075 – 0.0084

*Values with different letter are significantly different based on DMRT test with $\alpha = 5\%$

Table 4. A_w of Fresh Rice Flour-based Spring Roll Wrappers on Different Time of Tempering

Time of Tempering (minutes)	A_w *
30	0.520 a
45	0.526 ab
60	0.529 b

*Values with different letter are significantly different based on DMRT test with $\alpha = 5\%$

Moisture Content

The average moisture content showed a trend of increasing water content as increasing levels of amylose. This phenomenon is caused by the amount of water entrapped in the gel system will be more and more with the increased amylose content. This deals with the role of amylose on gel formation (Gimeno, et al., 2004).

Table 5. Water Content of Fresh Rice Flour-based Spring Roll Wrappers on Different Levels of Amylose Content

Amylose content (%)	Water content (%)*
25 %	36.30 a
28 %	36.83 a
31 %	39.25 b
34 %	40.24 b
37 %	41.27 b
40 %	41.29 b
DMRT 5%	2.2834 - 2.5690

*Values with different letter are significantly different based on DMRT test with $\alpha = 5\%$

Elongation

The result in Table 6 showed increasing of amylose content and it affected the distance of molecular components which decreased cohesiveness. In this condition water in the system acted as a plasticizer materials (Chang et al., 2006).

Table 6. Elongation at Break of Fresh Rice Flour-based Spring Roll Wrappers on Different Levels of Amylose Content

Amylose Content (%)	Elongation at Break (%)*
25	16.07 e
28	14.52 d
31	14.27 cd
34	13.71 c
37	12.03 b
40	10.96 a
DMRT 5%	0.6835 – 07690

*Values with different letter are significantly different based on DMRT test with $\alpha = 5\%$

CONCLUSION

Based on the study of all the response of depended variables, it can be concluded that the treatment of amylose content of rice flour and long of tempering time influenced the characteristics of fresh rice flour-based spring roll wrappers. Amylose content in the range of 25% to 40% tend to increase the moisture content of product. Tempering is longer than 60 minutes is not recommended in relation to the decrease of elongation.

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