6. REFERENCES

Alan Warde 'Consumption and the theory of practice', *Journal of Consumer Culture*, 5(2) (2005) 131-54.

CODEX 288-1976. Codex Standard for Cream and Prepared Creams. Formerly CODEX STAN A-9-1976. Adopted in 1976. Revision 2003, 2008. Amendment 2010.

D. Kilcast et al, 2000. The stability and shelf-life of food.Woodhead Publishing Limited. Boston. England. Page 3-7.

Flour Fortification Initiative (FFI) Organization. 2008. Premix Best Practices. USA.

Herawati, 2008. Shelf-life determination of food product. Penentuan Umur Simpan Pada Produk Pangan. Ungaran.3-7.

Ihara K., Habara K., Ozaki Y., Nakamura K., Ochi H., Saito H., Asaoka H., Uozumi M., Ichihashi N. and Iwatsuki K. (2010). Influence of whipping temperature on the whipping properties and rheological characteristics of whipped cream. *Journal of Dairy Science, 93,7,* 2887-2895.

Jakubczyk E. and Niranjan K. (2006).Transient development of whipped cream properties. *Journal of Food engineering, 77,* 79-83.

Kusnandar, 2008.Aplikasi program komputer sebagai alat bantu penentuan umur simpan produk pangan : metode Arrhenius. Pelatihan pendugaan waktu kadaluwarsa (shelflife) Bahan dan Produk Pangan. Bogor, 1-2 Desember 2004. Pusat Studi Pangan dan Gizi, Institut Pertanian Bogor.

Lakshmi, J. 2012. Bakery and Confectionary Products. Acharya N. G. Ranga Agricultural University. Bapatla, India.

McCance and Widdowson, 2002. The Nutritional Composition of Dairy products. The Dairy Council. Cambridge: Royal Society of Chemistry.

Nau (2005). A good value of R-squared. Course Online-Decision 411 Forecasting. http://people.duke.edu/~rnau/411home.htm. Accessed at September 9th, 2013.

Plasch, G. 2007. Premix and Complete Mixes. Page 287-295.

Precision Weighing Balance, 2011. The use of moisture balance. http:// balance. balances. com/ scales/1128/. Accessed at October 18th, 2013.

Robert L. Worden (eds.). *Indonesia: A Country Study.* 5th ed. Washington, D.C.: Library of Congress, 1993.

Robertson (1993).Pasteurisation and homogenization.*Cream Processing Manual* (ed. J. Rothwell),2ndedn., pp. 26–33, The Society of Dairy Technology, Cambridge.

Rotronic Instrument,_____. Rotronic Hygopalm Manual Instructions. http://www.rotronic.co.uk/ hygropalm23-aw-hp23-aw.html. Accessed at October 18th, 2013.

Segall K.I. and Goff H.D. (2002). Secondary adsorption of milk proteins from the continuous phase to the oil–water interface in dairy emulsions.*International Dairy Journal, 12,* 889–897.

Shamsi K., Che Man Y.B., Yusoff M.S.A. and Jinap S. (2002).A comparative study of dairy whipping cream and palm oil-based whipping cream in terms of fatty acids. Composition and foam stability. *JAOCS, 79,* nr. 6. Lampert,1975

Smith *et. al.*, 1999. Whipped Cream Structure. Food Science University of Guelph. Canada.

Templeton H.L. and Sommer H.H. (1932).Studies of whipping cream.Dairy compartment, College of Agriculture, Madison, Wisconsin, USA.

Tamime, A. Y., 2009. Dairy Fats and Related Products. Society of Dairy Technology. UK. Page 66-72 (Chapter 4-Whipping Cream).

van Lent K., Vanlerberghe B., Van Oostveldt P., Thas O. and Van der Meeren P. (2008). Determination of water droplet size distribution in butter: Pulsed field gradient NMR in comparison with confocal scanning laser microscopy. *International Dairy Journal, 18,* 12–22.

Vermeir, Lien. 2011. Formulation and characterization aspects of low fat whipping cream by Water/Oil/Water technology. Belgia.

Walstra P., *et al.*, 2008. Dairy Science and Technology Second Edition. USA.

Weldon. 2012. Complete Moisture Analysis Seminar. AquaLab-Decagon. Washington.

Zhao Q., Zhao M., Wang J., Wang C. and Yang B. (2008). Effects of sodium caseinate and whey proteins on whipping properties and texture characteristics of whipped cream. *Journal of Food Process Engineering, 31,* 671–683.

7. APPENDICES

7.1. Linear equation of whipping cream premix shelf-life during storage

7.1.1. Moisture content
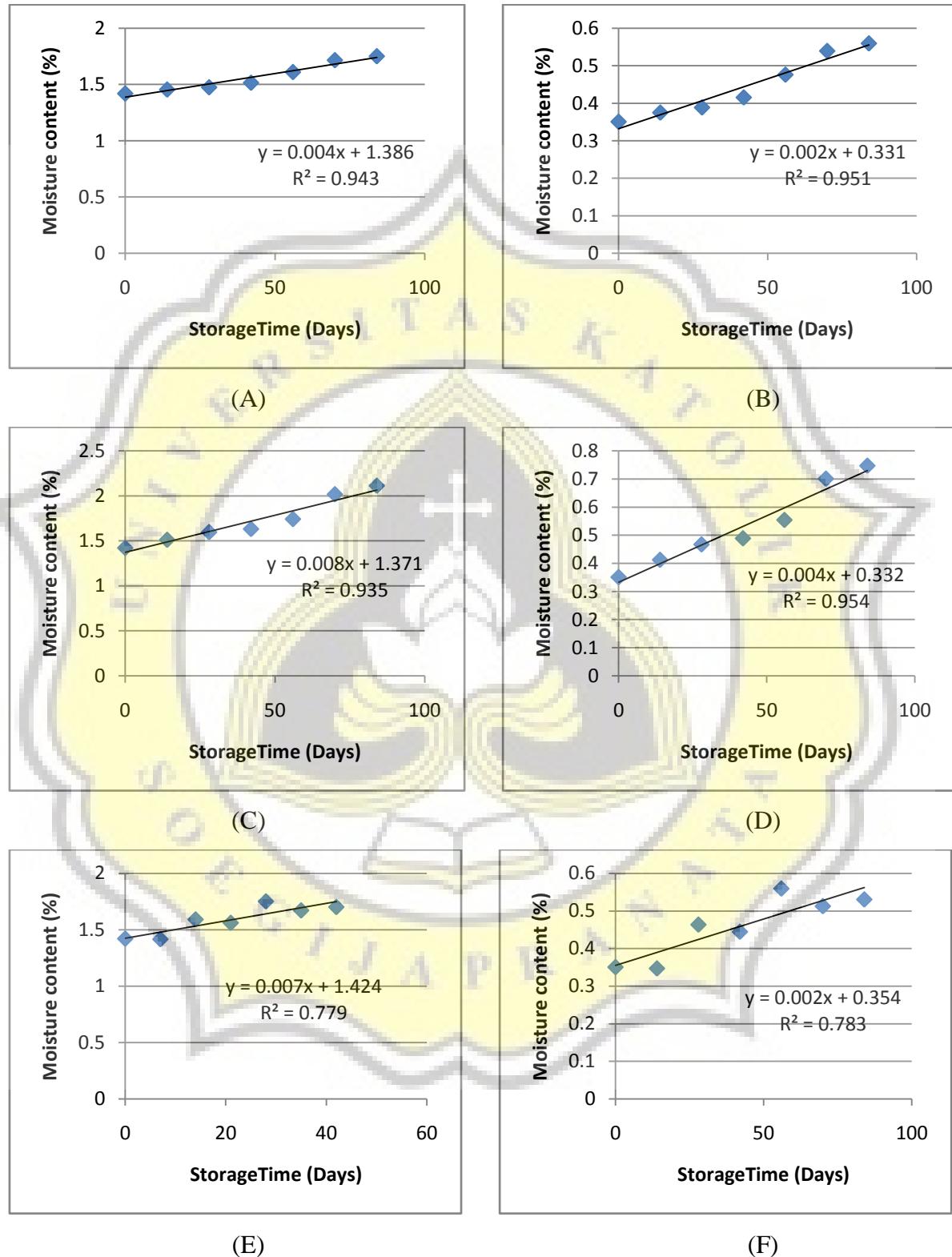
Figure 18 The linear equation of whipping cream premix during storage based on moisture content variable at (A) Order 0 Temp. 21°C, (B) Order 1 Temp. 21°C, (C) Order 0 Temp. 27°C, (D) Order 1 Temp. 27°C, (E) Order 0 Temp. 37°C, (F) Order 1 Temp. 37°C.

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7.1.2. Water Activity

(A)

(B)

(C)

(D)

(E)

(F)
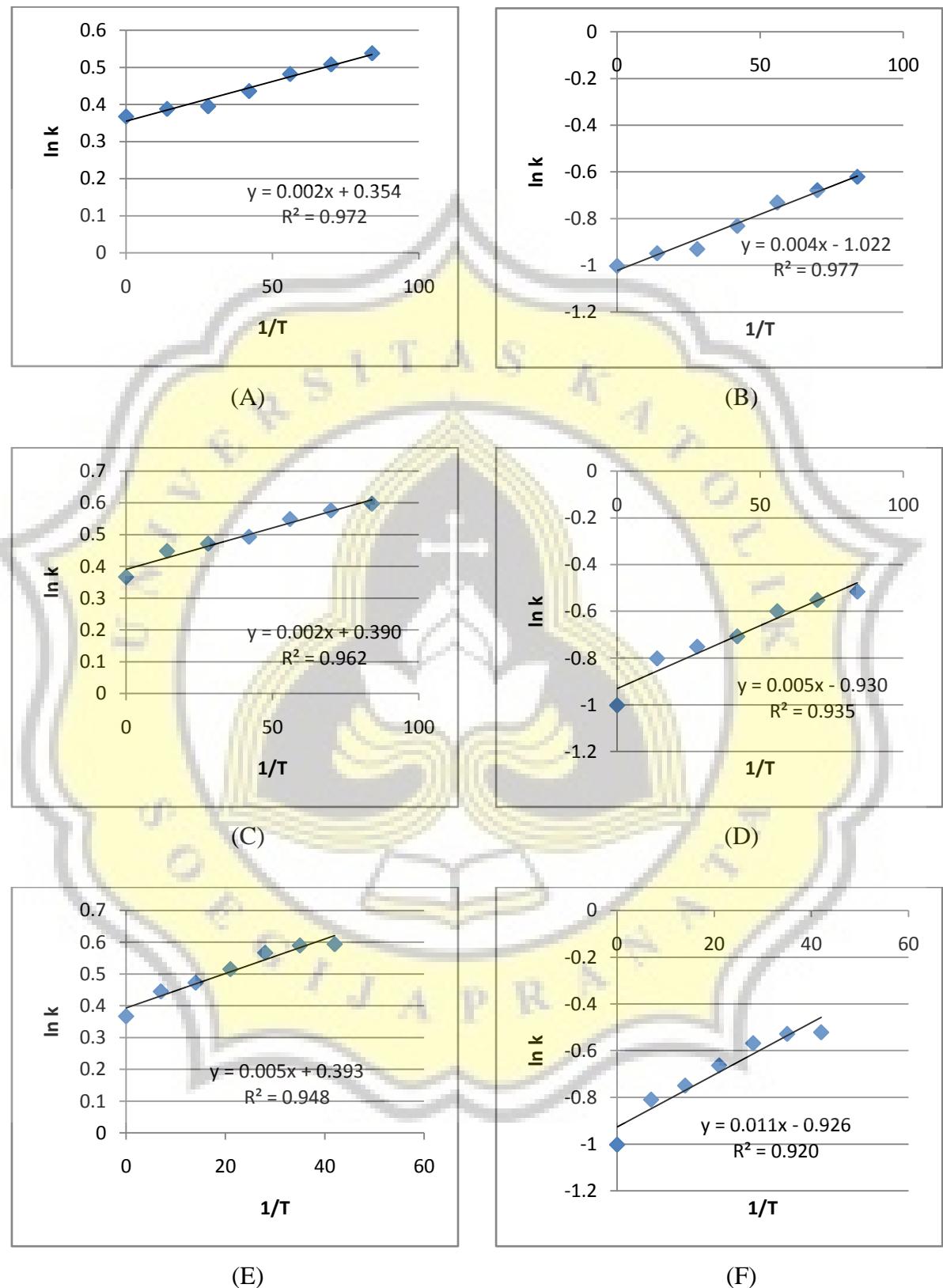
Figure 19 The linear equation of whipping cream premix during storage based on water activity variable at (A) Order 0 Temp. 21°C, (B) Order 1 Temp. 21°C, (C) Order 0 Temp. 27°C, (D) Order 1 Temp. 27°C, (E) Order 0 Temp. 37°C, (F) Order 1 Temp. 37°C.

7.1.3. Overrun 1
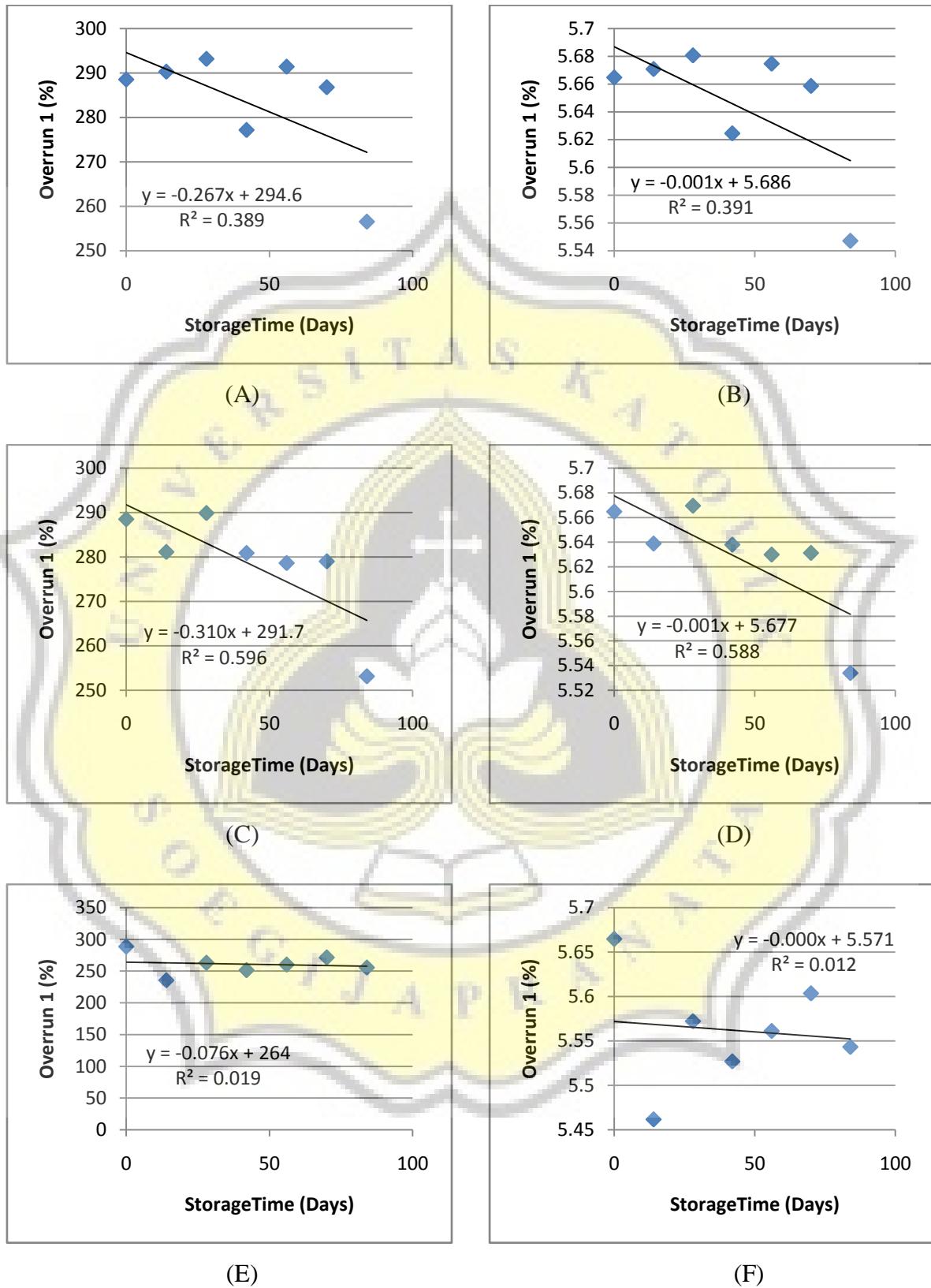
Figure 20 The linear equation of whipping cream premix during storage based on overrun 1 variable at (A) Order 0 Temp. 21°C, (B) Order 1 Temp. 21°C, (C) Order 0 Temp. 27°C, (D) Order 1 Temp. 27°C, (E) Order 0 Temp. 37°C, (F) Order 1 Temp. 37°C.

7.1.4. Overrun 2
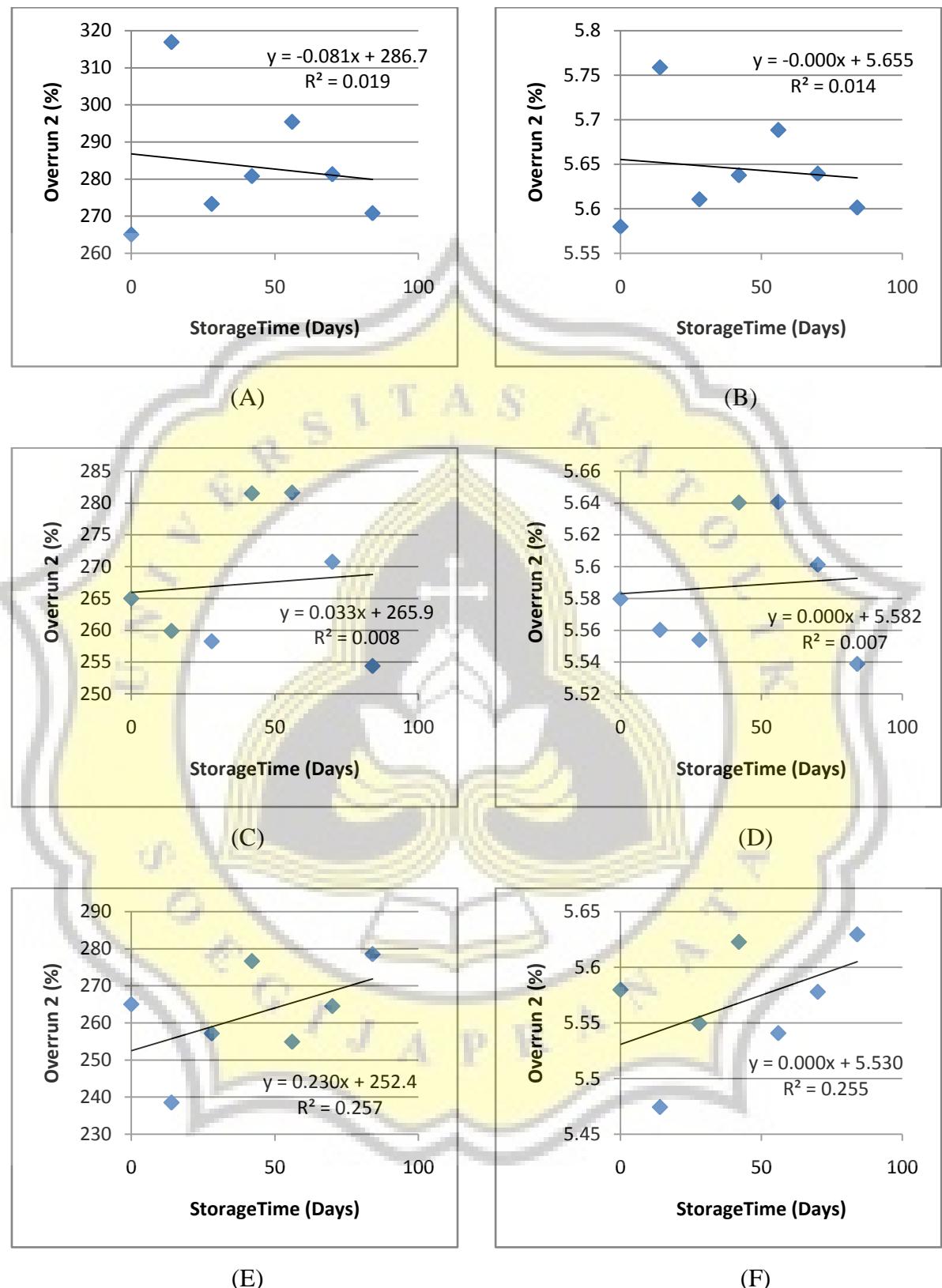

Figure 21 The linear equation of whipping cream premix during storage based on overrun 2 variable at (A) Order 0 Temp. 21°C, (B) Order 1 Temp. 21°C, (C) Order 0 Temp. 27°C, (D) Order 1 Temp. 27°C, (E) Order 0 Temp. 37°C, (F) Order 1 Temp. 37°C.

7.1.5. Stiffness 1
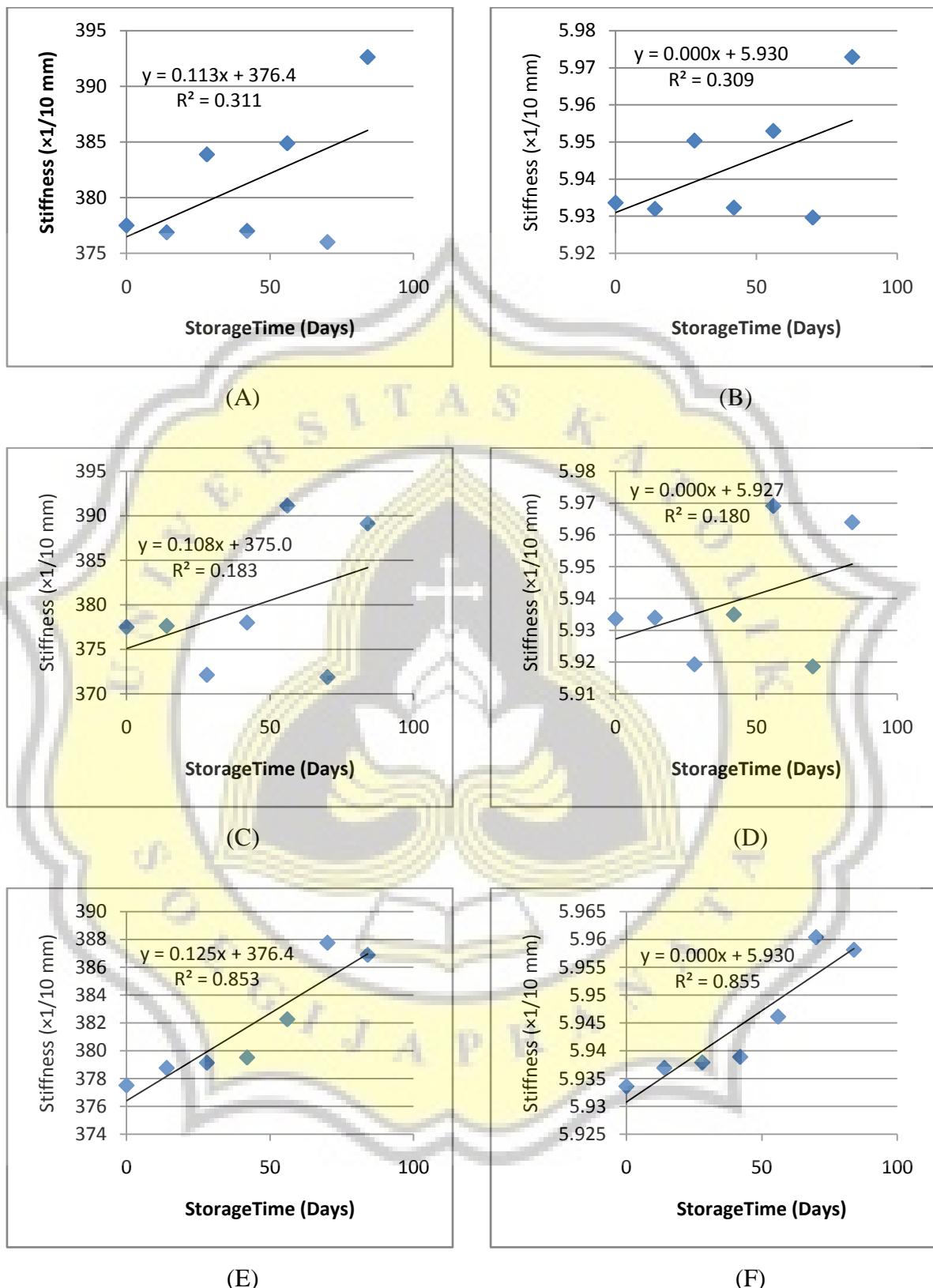
Figure 22 The linear equation of whipping cream premix during storage based on stiffness 1 variable at (A) Order 0 Temp. 21°C, (B) Order 1 Temp. 21°C, (C) Order 0 Temp. 27°C, (D) Order 1 Temp. 27°C, (E) Order 0 Temp. 37°C, (F) Order 1 Temp. 37°C.

7.1.6. Stiffness 2
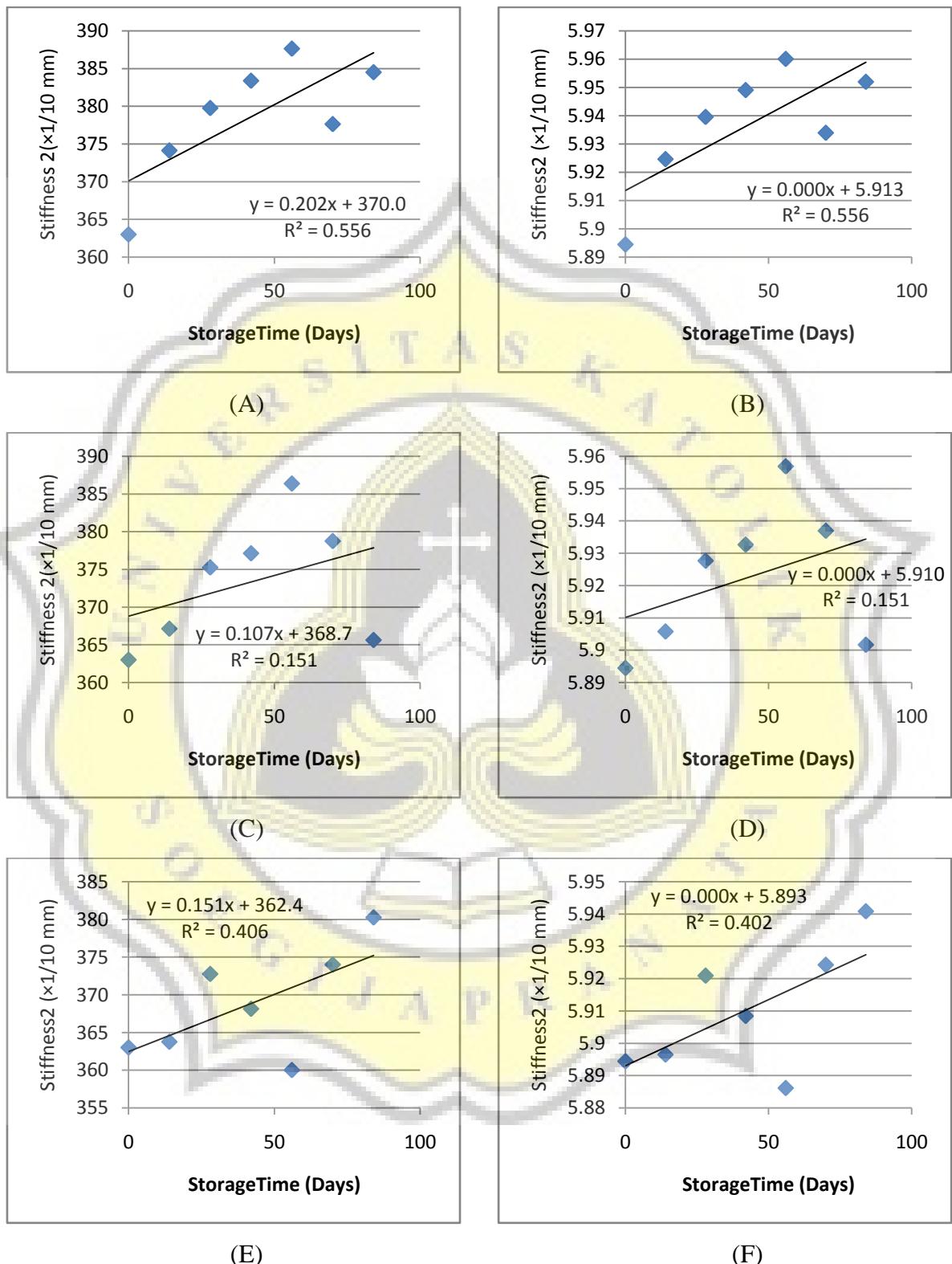
Figure 23 The linear equation of whipping cream premix during storage based on stiffness 2 variable at (A) Order 0 Temp. 21°C, (B) Order 1 Temp. 21°C, (C) Order 0 Temp. 27°C, (D) Order 1 Temp. 27°C, (E) Order 0 Temp. 37°C, (F) Order 1 Temp. 37°C.

**7.2. Calculation of whipping cream premix shelf-life at room temperature (25°C/ 298°K)**

7.2.1. Based on Moisture Content Variable

y = -3.591x + 6,172

ln k = -3.591 (1/T) + 6,172

ln k = -3.591 (1/298) + 6,172

ln k = -5,8783

k = 0,0028

Therefore the shelf-life of whipping cream based on its moisture content (order 1) is:

$$t_s = \frac{\ln Q_o - \ln Q_e}{k} = \frac{1.42 - \ln 3}{0.0028} = 267{,}18 \text{ days}$$

7.2.2. Based on Water Activity Variable

y = -5.507x + 12,5

y = -5.507 (1/T) + 12,5

y = -5.507 (1/298) + 12,5

y = -5,979 => ln k

k = 0,00253

Therefore the shelf-life of whipping cream based on its water activity (order 0) is:

$$t_s = \frac{Q_o - Q_e}{k} = \frac{0,367 - 1}{0,00253} = 250{,}28 \text{ days}$$

7.3. One-way ANOVA test

7.3.1. Moisture Content

Descriptive Statistics

Dependent Variable: Moisture_Content

Time_Point	Treatment	Mean	Std. Deviation	N
0	21 C	1.4200	.04243	2
	27 C	1.4200	.04243	2
	37 C	1.4200	.04243	2
	Total	1.4200	.03286	6
1	21 C	1.4550	.03536	2
	27 C	1.5100	.02828	2
	37 C	1.4150	.07778	2
	Total	1.4600	.05865	6
2	21 C	1.4750	.03536	2
	27 C	1.5950	.00707	2
	37 C	1.5900	.07071	2
	Total	1.5533	.07033	6
3	21 C	1.5150	.02121	2
	27 C	1.6300	.02828	2
	37 C	1.5600	.05657	2
	Total	1.5683	.05981	6
4	21 C	1.6100	.02828	2
	27 C	1.7400	.01414	2
	37 C	1.7500	.09899	2
	Total	1.7000	.08390	6
5	21 C	1.7150	.04950	2
	27 C	2.0150	.04950	2
	37 C	1.6700	.08485	2
	Total	1.8000	.17481	6
6	21 C	1.7500	.02828	2
	27 C	2.1100	.01414	2
	37 C	1.7000	.07071	2
	Total	1.8533	.20304	6
Total	21 C	1.5629	.12821	14

27 C	1.7171	.24821	14
37 C	1.5864	.13782	14
Total	1.6221	.18838	42

Moisture_Content_21C

Duncan

		Subset for alpha = 0.05			
Storage_Time	N	1	2	3	4
day 0	2	1.4200			
day 14	2	1.4550	1.4550		
day 28	2	1.4750	1.4750		
day 42	2		1.5150		
day 56	2			1.6100	
day 70	2				1.7150
day 84	2				1.7500
Sig.		.179	.147	1.000	.356

Means for groups in homogeneous subsets are displayed.

Moisture_Content_27C

Duncan

		Subset for alpha = 0.05					
Storage_Time	N	1	2	3	4	5	6
day 0	2	1.4200					
day 14	2		1.5100				
day 28	2			1.5950			
day 42	2			1.6300			
day 56	2				1.7400		
day 70	2					2.0150	
day 84	2						2.1100
Sig.		1.000	1.000	.282	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Moisture_Content_37C

Duncan

Storage_Time	N	Subset for alpha = 0.05		
		1	2	3
day 0	2	1.4200		
day 7	2	1.4150		
day 14	2	1.5900	1.5900	1.5900
day 21	2	1.5600	1.5600	
day 28	2			1.7500
day 35	2		1.6700	1.6700
day 42	2		1.7000	1.7000
Sig.		.060	.116	.080

Means for groups in homogeneous subsets are displayed.

Moisture_Content_Day_0

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	2	1.4200
27 C	2	1.4200
37 C	2	1.4200
Sig.		1.000

Means for groups in homogeneous subsets are displayed.

Moisture_Content_Day_28

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	2	1.4750	
27 C	2	1.5950	1.5950
37 C	2		1.7500
Sig.		.143	.084

Means for groups in homogeneous subsets are displayed.

Moisture_Content_Day_14

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	2	1.4550
27 C	2	1.5100
37 C	2	1.5900
Sig.		.069

Means for groups in homogeneous subsets are displayed.

Moisture_Content_Day_42

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	2	1.5150	
27 C	2	1.6300	1.6300
37 C	2		1.7000
Sig.		.086	.223

Means for groups in homogeneous subsets are displayed.

7.3.2. Water Activity

Descriptive Statistics

Dependent Variable:Water_Activity

Time_Point	Treatment	Mean	Std. Deviation	N
0	21 C	.3670	.00849	2
	27 C	.3670	.00849	2
	37 C	.3670	.00849	2
	Total	.3670	.00657	6
1	21 C	.3875	.00495	2
	27 C	.4485	.02192	2
	37 C	.4450	.03536	2
	Total	.4270	.03591	6
2	21 C	.3945	.00212	2
	27 C	.4715	.02616	2
	37 C	.4725	.02051	2
	Total	.4462	.04271	6
3	21 C	.4355	.01202	2
	27 C	.4930	.01556	2
	37 C	.5150	.04525	2
	Total	.4812	.04284	6
4	21 C	.4815	.00778	2
	27 C	.5490	.06081	2
	37 C	.5665	.00212	2
	Total	.5323	.04862	6
5	21 C	.5075	.01909	2
	27 C	.5760	.02546	2
	37 C	.5895	.01344	2
	Total	.5577	.04225	6
6	21 C	.5375	.00495	2
	27 C	.5970	.00990	2
	37 C	.5935	.00778	2
	Total	.5760	.03047	6
Total	21 C	.4444	.06345	14
	27 C	.5003	.08014	14
	37 C	.5070	.08278	14
	Total	.4839	.07932	42

Water_Activity_21C

Duncan

Storage_Time	N	Subset for alpha = 0.05					
		1	2	3	4	5	6
day 0	2	.36700					
day 14	2	.38750	.38750				
day 28	2		.39450				
day 42	2			.43550			
day 56	2				.48150		
day 70	2					.50750	
day 84	2						.53750
Sig.		.079	.505	1.000	1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Water_Activity_27C

Duncan

Storage_Time	N	Subset for alpha = 0.05			
		1	2	3	4
day 0	2	.36700			
day 14	2		.44850		
day 28	2		.47150		
day 42	2		.49300	.49300	
day 56	2			.54900	.54900
day 70	2				.57600
day 84	2				.59700
Sig.		1.000	.184	.096	.156

Means for groups in homogeneous subsets are displayed.

Water_Activity_37C

Duncan

Storage_Time	N	Subset for alpha = 0.05				
		1	2	3	4	5
day 0	2	.36700				
day 7	2		.44500			
day 14	2		.47250	.47250		
day 21	2			.51500	.51500	
day 28	2				.56650	.56650
day 35	2					.58950
day 42	2					.59350
Sig.		1.000	.290	.120	.069	.315

Means for groups in homogeneous subsets are displayed.

Water_Activity_Day_0

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	2	.36700
27 C	2	.36700
37 C	2	.36700
Sig.		1.000

Means for groups in homogeneous subsets are displayed.

Water_Activity_Day_28

Duncan

Treatment	N	Subset for alpha = 0.05		
		1	2	3
21 C	2	.39450		
27 C	2		.47150	
37 C	2			.56650
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

Water_Activity_Day_14

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	2	.38750	
27 C	2		.44850
37 C	2		.47250
Sig.		1.000	.265

Means for groups in homogeneous subsets are displayed.

Water_Activity_Day_42

Duncan

Treatment	N	Subset for alpha = 0.05		
		1	2	3
21 C	2	.43550		
27 C	2		.49300	
37 C	2			.59350
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

7.3.3. Overrun 1

Descriptive Statistics

Dependent Variable:Overrun_1

Time_Point	Treatment	Mean	Std. Deviation	N
0	21 C	288.5000	4.94975	2
	27 C	288.5000	4.94975	2
	37 C	288.5000	4.94975	2
	Total	288.5000	3.83406	6
1	21 C	290.2500	22.98097	2
	27 C	281.1250	7.95495	2
	37 C	235.5000	21.92031	2
	Total	268.9583	30.04514	6
2	21 C	293.1250	13.61181	2
	27 C	289.8750	2.29810	2
	37 C	263.0000	4.24264	2
	Total	282.0000	16.13769	6
3	21 C	277.1250	6.18718	2
	27 C	280.8750	1.23744	2
	37 C	251.3750	1.94454	2
	Total	269.7917	14.66409	6
4	21 C	291.3750	5.83363	2
	27 C	278.6250	1.94454	2
	37 C	260.1250	4.06586	2
	Total	276.7083	14.43556	6
5	21 C	286.7500	1.06066	2
	27 C	279.0000	4.94975	2
	37 C	271.3750	1.23744	2
	Total	279.0417	7.26019	6
6	21 C	256.5000	4.59619	2
	27 C	253.1250	4.77297	2
	37 C	255.5000	4.24264	2
	Total	255.0417	3.84518	6
Total	21 C	283.3750	14.78849	14
	27 C	278.7321	12.14356	14
	37 C	260.7679	17.19947	14
	Total	274.2917	17.52871	42

Overrun_1_21C

Duncan

Storage_Time	N	Subset for alpha = 0.05	
		1	2
day 0	2		288.5000
day 14	8		290.2500
day 28	8		293.1250
day 42	8	277.1250	277.1250
day 56	8		291.3750
day 70	8		286.7500
day 84	8	256.5000	
Sig.		.088	.244

Means for groups in homogeneous subsets are displayed.

Overrun_1_27C

Duncan

Storage_Time	N	Subset for alpha = 0.05	
		1	2
day 0	2		288.5000
day 14	8		281.1250
day 28	8		289.8750
day 42	8		280.8750
day 56	8		278.6250
day 70	8		279.0000
day 84	8	253.1250	
Sig.		1.000	.183

Means for groups in homogeneous subsets are displayed.

Overrun_1_37C

Duncan

Storage_Time	N	Subset for alpha = 0.05				
		1	2	3	4	5
day 0	2					288.5000
day 7	4	235.5000				
day 14	8			263.0000	263.0000	
day 21	8		251.3750			
day 28	8		260.1250	260.1250		
day 35	8				271.3750	
day 42	8		255.5000	255.5000		
Sig.		1.000	.097	.154	.094	1.000

Means for groups in homogeneous subsets are displayed.

Overrun_1_Day_0

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	2	288.5000
27 C	2	288.5000
37 C	2	288.5000
Sig.		1.000

Means for groups in homogeneous subsets are
displayed.

Overrun_1_Day_28

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		293.1250
27 C	8		289.8750
37 C	8	260.1250	
Sig.		1.000	.662

Means for groups in homogeneous subsets are
displayed.

Overrun_1_Day_14

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		290.2500
27 C	8		281.1250
37 C	8	263.0000	
Sig.		1.000	.197

Means for groups in homogeneous subsets are
displayed.

Overrun_1_Day_42

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		277.1250
27 C	8		280.8750
37 C	8	255.5000	
Sig.		1.000	.495

Means for groups in homogeneous subsets are
displayed.

7.3.4. Overrun 2

Descriptive Statistics

Dependent Variable:Overrun_2

Time_Point	Treatment	Mean	Std. Deviation	N
0	21 C	265.0000	.00000	2
	27 C	265.0000	.00000	2
	37 C	265.0000	.00000	2
	Total	265.0000	.00000	6
1	21 C	316.8750	12.90470	2
	27 C	259.8750	25.98617	2
	37 C	238.5000	12.02082	2
	Total	271.7500	38.86386	6
2	21 C	273.2500	9.89949	2
	27 C	258.2500	14.14214	2
	37 C	257.1250	4.06586	2
	Total	262.8750	11.30238	6
3	21 C	280.7500	1.06066	2
	27 C	281.5000	9.89949	2
	37 C	276.6250	29.52171	2
	Total	279.6250	14.12953	6
4	21 C	295.3750	13.25825	2
	27 C	281.6250	12.90470	2
	37 C	254.8750	1.23744	2
	Total	277.2917	20.20112	6
5	21 C	281.2500	15.20280	2
	27 C	270.7500	20.15254	2
	37 C	264.5000	8.48528	2
	Total	272.1667	14.11264	6
6	21 C	270.7500	31.46625	2
	27 C	254.3750	17.14734	2
	37 C	278.5000	4.59619	2
	Total	267.8750	19.55553	6
Total	21 C	283.3214	20.41314	14
	27 C	267.3393	15.92338	14
	37 C	262.1607	16.13215	14
	Total	270.9405	19.44550	42

Overrun_2_21C

Duncan

| Storage_Time | N | Subset for alpha = 0.05 | | |
		1	2	3
day 0	2	265.0000		
day 14	8			316.8750
day 28	8	273.2500	273.2500	
day 42	8	280.7500	280.7500	
day 56	8		295.3750	295.3750
day 70	8	281.2500	281.2500	
day 84	8	270.7500	270.7500	
Sig.		.264	.091	.099

Means for groups in homogeneous subsets are displayed.

Overrun_2_27C

Duncan

| Storage_Time | N | Subset for alpha = 0.05 |
		1
day 0	2	265.0000
day 14	8	259.8750
day 28	8	258.2500
day 42	8	281.5000
day 56	8	281.6250
day 70	8	270.7500
day 84	8	254.3750
Sig.		.066

Means for groups in homogeneous subsets are displayed.

Overrun_2_37C

Duncan

Storage_Time	N	Subset for alpha = 0.05		
		1	2	3
day 0	2		265.0000	265.0000
day 7	4	238.5000		
day 14	8		257.1250	
day 21	8			276.6250
day 28	8		254.8750	
day 35	8		264.5000	264.5000
day 42	8			278.5000
Sig.		1.000	.251	.113

Means for groups in homogeneous subsets are displayed.

Overrun_2_Day_0

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	2	264.5000
27 C	2	264.5000
37 C	2	264.5000
Sig.		1.000

Means for groups in homogeneous subsets are displayed.

Overrun_2_Day_28

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		273.2500
27 C	8	258.2500	
37 C	8	254.8750	
Sig.		.580	1.000

Means for groups in homogeneous subsets are displayed.

Overrun_2_Day_14

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		316.8750
27 C	8	259.8750	
37 C	8	257.1250	
Sig.		.791	1.000

Means for groups in homogeneous subsets are displayed.

Overrun_2_Day_42

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	8	280.7500
27 C	8	281.5000
37 C	8	278.5000
Sig.		.495

Means for groups in homogeneous subsets are displayed.

7.3.5. Stiffness 1

Descriptive Statistics

Dependent Variable:Stiffness_1

Time_Point	Treatment	Mean	Std. Deviation	N
0	21 C	377.5000	3.53553	2
	27 C	377.5000	3.53553	2
	37 C	377.5000	3.53553	2
	Total	377.5000	2.73861	6
1	21 C	376.8750	4.06586	2
	27 C	377.6250	1.23744	2
	37 C	378.7500	3.18198	2
	Total	377.7500	2.51992	6
2	21 C	383.8750	1.23744	2
	27 C	372.1250	.17678	2
	37 C	379.1250	4.06586	2
	Total	378.3750	5.61861	6
3	21 C	377.0000	2.12132	2
	27 C	378.0000	3.53553	2
	37 C	379.5000	3.18198	2
	Total	378.1667	2.58683	6
4	21 C	384.8750	9.36916	2
	27 C	391.1250	.17678	2
	37 C	382.2500	6.36396	2
	Total	386.0833	6.50320	6
5	21 C	376.0000	6.36396	2
	27 C	371.8750	.88388	2
	37 C	387.7500	2.47487	2
	Total	378.5417	7.98501	6
6	21 C	392.6250	.53033	2
	27 C	389.1250	7.60140	2
	37 C	386.8750	4.41942	2
	Total	389.5417	4.71544	6
Total	21 C	381.2500	6.90666	14
	27 C	379.6250	7.77122	14
	37 C	381.6786	4.94919	14
	Total	380.8512	6.54535	42

Stiffness_1_21C

Duncan

Storage_Time	N	Subset for alpha = 0.05	
		1	2
day 0	2	377.5000	
day 14	8	376.8750	
day 28	8	383.8750	383.8750
day 42	8	377.0000	
day 56	8	384.8750	384.8750
day 70	8	376.0000	
day 84	8		392.6250
Sig.		.144	.121

Means for groups in homogeneous subsets are displayed.

Stiffness_1_27C

Duncan

Storage_Time	N	Subset for alpha = 0.05	
		1	2
day 0	2	377.5000	
day 14	8	377.6250	
day 28	8	372.1250	
day 42	8	378.0000	
day 56	8		391.1250
day 70	8	371.8750	
day 84	8		389.1250
Sig.		.108	.552

Means for groups in homogeneous subsets are displayed.

Stiffness_1_37C

Duncan

| Storage_Time | N | Subset for alpha = 0.05 |
		1
day 0	2	377.5000
day 7	4	378.7500
day 14	8	379.1250
day 21	8	379.5000
day 28	8	382.2500
day 35	8	387.7500
day 42	8	386.8750
Sig.		.061

Means for groups in homogeneous subsets are displayed.

Stiffness_1_Day_0

Duncan

| Treatment | N | Subset for alpha = 0.05 |
		1
21 C	2	377.5000
27 C	2	377.5000
37 C	2	377.5000
Sig.		1.000

Means for groups in homogeneous subsets are displayed.

Stiffness_1_Day_28

Duncan

| Treatment | N | Subset for alpha = 0.05 | |
		1	2
21 C	8		383.8750
27 C	8	372.1250	
37 C	8		382.2500
Sig.		1.000	.575

Means for groups in homogeneous subsets are displayed.

Stiffness_1_Day_14

Duncan

| Treatment | N | Subset for alpha = 0.05 |
		1
21 C	8	376.8750
27 C	8	377.6250
37 C	8	379.1250
Sig.		.721

Means for groups in homogeneous subsets are displayed.

Stiffness_1_Day_42

Duncan

| Treatment | N | Subset for alpha = 0.05 | |
		1	2
21 C	8	377.0000	
27 C	8	378.0000	
37 C	8		386.8750
Sig.		.723	1.000

Means for groups in homogeneous subsets are displayed.

7.3.6. Stiffness 2

Descriptive Statistics

Dependent Variable:Stiffness_2

Time_Point	Treatment	Mean	Std. Deviation	N
0	21 C	363.0000	4.24264	2
	27 C	363.0000	4.24264	2
	37 C	363.0000	4.24264	2
	Total	363.0000	3.28634	6
1	21 C	374.1250	3.35876	2
	27 C	367.1250	1.59099	2
	37 C	363.7500	8.13173	2
	Total	368.3333	6.19610	6
2	21 C	379.7500	2.82843	2
	27 C	375.2500	9.54594	2
	37 C	372.7500	2.82843	2
	Total	375.9167	5.61174	6
3	21 C	383.3750	6.54074	2
	27 C	377.1250	3.71231	2
	37 C	368.1250	4.06586	2
	Total	376.2083	7.85082	6
4	21 C	387.6250	5.83363	2
	27 C	386.3750	5.12652	2
	37 C	360.0000	2.47487	2
	Total	378.0000	14.42221	6
5	21 C	377.6250	5.12652	2
	27 C	378.7500	.70711	2
	37 C	374.0000	13.78858	2
	Total	376.7917	6.95057	6
6	21 C	384.5000	6.71751	2
	27 C	365.6250	10.78338	2
	37 C	380.2500	3.18198	2
	Total	376.7917	10.61769	6
Total	21 C	378.5714	8.74831	14
	27 C	373.3214	9.25256	14
	37 C	368.8393	8.48789	14
	Total	373.5774	9.51098	42

Stiffness_2_21C

Duncan

Storage_Time	N	Subset for alpha = 0.05		
		1	2	3
day 0	2	363.0000		
day 14	8		374.1250	
day 28	8		379.7500	379.7500
day 42	8		383.3750	383.3750
day 56	8			387.6250
day 70	8		377.6250	377.6250
day 84	8		384.5000	384.5000
Sig.		1.000	.064	.075

Means for groups in homogeneous subsets are displayed.

Stiffness_2_27C

Duncan

Storage_Time	N	Subset for alpha = 0.05	
		1	2
day 0	2	363.0000	
day 14	8	367.1250	
day 28	8	375.2500	375.2500
day 42	8	377.1250	377.1250
day 56	8		386.3750
day 70	8	378.7500	378.7500
day 84	8	365.6250	
Sig.		.053	.155

Means for groups in homogeneous subsets are displayed.

Stiffness_2_37C

Duncan

Storage_Time	N	Subset for alpha = 0.05		
		1	2	3
day 0	2	363.0000	363.0000	
day 7	4	363.7500	363.7500	
day 14	8		372.7500	372.7500
day 21	8	368.1250	368.1250	
day 28	8	360.0000		
day 35	8		374.0000	374.0000
day 42	8			380.2500
Sig.		.187	.081	.207

Means for groups in homogeneous subsets are displayed.

Stiffness_2_Day_0

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	2	363.0000
27 C	2	363.0000
37 C	2	363.0000
Sig.		1.000

Means for groups in homogeneous subsets are displayed.

Stiffness_2_Day_28

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		379.7500
27 C	8		375.2500
37 C	8	360.0000	
Sig.		1.000	.237

Means for groups in homogeneous subsets are displayed.

Stiffness_2_Day_14

Duncan

Treatment	N	Subset for alpha = 0.05	
		1	2
21 C	8		374.1250
27 C	8	367.1250	
37 C	8	372.7500	372.7500
Sig.		.079	.656

Means for groups in homogeneous subsets are displayed.

Stiffness_2_Day_42

Duncan

Treatment	N	Subset for alpha = 0.05
		1
21 C	8	383.3750
27 C	8	377.1250
37 C	8	380.2500
Sig.		.369

Means for groups in homogeneous subsets are displayed.

7.4. Normality data test

7.4.1. Temperature treatment

Tests of Normality

	Treatment	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
		Statistic	df	Sig.	Statistic	df	Sig.
Moisture_Content	21 C	.188	14	.194	.914	14	.179
	27 C	.178	14	.200[*]	.898	14	.105
	37 C	.111	14	.200[*]	.978	14	.959
Water_Activity	21 C	.206	14	.111	.909	14	.151
	27 C	.154	14	.200[*]	.929	14	.292
	37 C	.187	14	.200[*]	.898	14	.105
Overrun_1	21 C	.164	14	.200[*]	.955	14	.642
	27 C	.252	14	.016	.841	14	.017
	37 C	.194	14	.160	.936	14	.366
Overrun_2	21 C	.113	14	.200[*]	.973	14	.915
	27 C	.156	14	.200[*]	.949	14	.544
	37 C	.164	14	.200[*]	.960	14	.719
Stiffness_1	21 C	.186	14	.200[*]	.914	14	.180
	27 C	.169	14	.200[*]	.880	14	.058
	37 C	.143	14	.200[*]	.938	14	.388
Stiffness_2	21 C	.121	14	.200[*]	.967	14	.839
	27 C	.131	14	.200[*]	.971	14	.886
	37 C	.131	14	.200[*]	.939	14	.408

a. Lilliefors Significance Correction

*. This is a lower bound of the true significance.

7.5. Correlation test

Correlations

		Moisture_Content	Water_Activity	Overrun_1	Overrun_2	Stiffness_1	Stiffness_2
Moisture_Content	Pearson Correlation	1	.812**	-.292	-.077	.300	.185
	Sig. (2-tailed)		.000	.060	.629	.054	.242
	N	42	42	42	42	42	42
Water_Activity	Pearson Correlation	.812**	1	-.468**	-.099	.431**	.260
	Sig. (2-tailed)	.000		.002	.534	.004	.096
	N	42	42	42	42	42	42
Overrun_1	Pearson Correlation	-.292	-.468**	1	.467**	-.327*	.193
	Sig. (2-tailed)	.060	.002		.002	.034	.222
	N	42	42	42	42	42	42
Overrun_2	Pearson Correlation	-.077	-.099	.467**	1	.021	.525**
	Sig. (2-tailed)	.629	.534	.002		.897	.000
	N	42	42	42	42	42	42
Stiffness_1	Pearson Correlation	.300	.431**	-.327*	.021	1	.286
	Sig. (2-tailed)	.054	.004	.034	.897		.066
	N	42	42	42	42	42	42
Stiffness_2	Pearson Correlation	.185	.260	.193	.525**	.286	1
	Sig. (2-tailed)	.242	.096	.222	.000	.066	
	N	42	42	42	42	42	42

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

7.6. Overrun Table

7.6.1. Cup Code 1532

NPW cup.

Cup Number   1532
Cup Volume   219,4 cc
Cup Weight   80,5 grams

DMV International
The ingredients of success

Weight	Overrun	Weight	Overrun	Weight	Overrun	Weight	Overrun
251	29	210	69	170	145	130	343
250	29	209	71	169	148	129	352
249	30	208	72	168	151	128	362
248	31	207	73	167	154	127	372
247	32	206	75	166	157	126	382
246	33	205	76	165	160	125	393
245	33	204	78	164	163	124	404
243	35	203	79	163	166	123	416
242	36	202	81	162	169	122	429
241	37	201	82	161	173	121	442
240	38	200	84	160	176	120	455
239	38	199	85	159	179	119	470
238	39	198	87	158	183	118	485
237	40	197	88	157	187	117	501
236	41	196	90	156	191	116	518
235	42	195	92	155	194	115	536
234	43	194	93	154	199	114	555
233	44	193	95	153	203	113	575
232	45	192	97	152	207	112	597
231	46	191	99	151	211	111	619
230	47	190	100	150	216	110	644
229	48	189	102	149	220	109	670
228	49	188	104	148	225	108	698
227	50	187	106	147	230	107	728
226	51	186	108	146	235	106	760
225	52	185	110	145	240	105	796
224	53	184	112	144	246	104	834
223	54	183	114	143	251	103	875
222	55	182	116	142	257	102	920
221	56	181	118	141	263	101	970
220	57	180	121	140	269	100	1025
219	58	179	123	139	275	99	1086
218	60	178	125	138	282	98	1154
217	61	177	127	137	288	97	1230
216	62	176	130	136	295	96	1315
215	63	175	132	135	303	95	1413
214	64	174	135	134	310	94	1525
213	66	173	137	133	318	93	1655
212	67	172	140	132	326	92	1808
211	68	171	142	131	334	91	1990

DMV International

NCB-laan 80, 5462GE Veghel
P.O. box 13, 5460BA Veghel
The Netherlands
Tel. +31 (0)413 372222

7.6.2. Cup Code 1535

Overrun / density table

Cup number = 1535
Cup weight = 80,1 g
Cup volume = 205,0 ml

Weight (g)	Overrun (%)	Density (g/l)	Weight (g)	Overrun (%)	Density (g/l)	Weight (g)	Overrun (%)	Density (g/l)
105	723	121	160	157	390	215	52	658
106	692	126	161	153	395	216	51	663
107	662	131	162	150	400	217	50	668
108	635	136	163	147	404	218	49	673
109	609	141	164	144	409	219	48	678
110	586	146	165	141	414	220	47	682
111	563	151	166	139	419	221	45	687
112	543	156	167	136	424	222	44	692
113	523	160	168	133	429	223	43	697
114	505	165	169	131	434	224	42	702
115	487	170	170	128	439	225	41	707
116	471	175	171	126	443	226	41	712
117	456	180	172	123	448	227	40	717
118	441	185	173	121	453	228	39	721
119	427	190	174	118	458	229	38	726
120	414	195	175	116	463	230	37	731
121	401	200	176	114	468	231	36	736
122	389	204	177	112	473	232	35	741
123	378	209	178	109	478	233	34	746
124	367	214	179	107	482	234	33	751
125	357	219	180	105	487	235	32	756
126	347	224	181	103	492	236	31	760
127	337	229	182	101	497	237	31	765
128	328	234	183	99	502	238	30	770
129	319	239	184	97	507	239	29	775
130	311	243	185	95	512	240	28	780
131	303	248	186	94	517	241	27	785
132	295	253	187	92	521	242	27	790
133	288	258	188	90	526	243	26	795
134	280	263	189	88	531	244	25	800
135	273	268	190	87	536	245	24	804
136	267	273	191	85	541	246	24	809
137	260	278	192	83	546	247	23	814
138	254	282	193	82	551	248	22	819
139	248	287	194	80	556	249	21	824
140	242	292	195	78	560	250	21	829
141	237	297	196	77	565	251	20	834
142	231	302	197	75	570	252	19	839
143	226	307	198	74	575	253	19	843
144	221	312	199	72	580	254	18	848
145	216	317	200	71	585	255	17	853
146	211	321	201	70	590	256	17	858
147	206	326	202	68	595	257	16	863
148	202	331	203	67	600	258	15	868
149	198	336	204	65	604	259	15	873
150	193	341	205	64	609	260	14	878
151	189	346	206	63	614	261	13	882
152	185	351	207	62	619	262	13	887
153	181	356	208	60	624	263	12	892
154	177	360	209	59	629	264	11	897
155	174	365	210	58	634	265	11	902
156	170	370	211	57	639	266	10	907
157	167	375	212	55	643	267	10	912
158	163	380	213	54	648	268	9	917
159	160	385	214	53	653	269	9	921

7.6.3. Cup Code 1536

Overrun / density table

kievit

Cup number = 1536
Cup weight = 80 g
Cup volume = 211,8 ml

Weight (g)	Overrun (%)	Density (g/l)	Weight (g)	Overrun (%)	Density (g/l)	Weight (g)	Overrun (%)	Density (g/l)
105	747	118	160	165	378	215	57	637
106	715	123	161	161	382	216	56	642
107	684	127	162	158	387	217	55	647
108	656	132	163	155	392	218	53	652
109	630	137	164	152	397	219	52	656
110	606	142	165	149	401	220	51	661
111	583	146	166	146	406	221	50	666
112	562	151	167	143	411	222	49	670
113	542	156	168	141	415	223	48	675
114	523	161	169	138	420	224	47	680
115	505	165	170	135	425	225	46	685
116	488	170	171	133	430	226	45	689
117	472	175	172	130	434	227	44	694
118	457	179	173	128	439	228	43	699
119	443	184	174	125	444	229	42	703
120	430	189	175	123	449	230	41	708
121	417	194	176	121	453	231	40	713
122	404	198	177	118	458	232	39	718
123	393	203	178	116	463	233	38	722
124	381	208	179	114	467	234	38	727
125	371	212	180	112	472	235	37	732
126	360	217	181	110	477	236	36	737
127	351	222	182	108	482	237	35	741
128	341	227	183	106	486	238	34	746
129	332	231	184	104	491	239	33	751
130	324	236	185	102	496	240	32	755
131	315	241	186	100	500	241	32	760
132	307	246	187	98	505	242	31	765
133	300	250	188	96	510	243	30	770
134	292	255	189	94	515	244	29	774
135	285	260	190	93	519	245	28	779
136	278	264	191	91	524	246	28	784
137	272	269	192	89	529	247	27	788
138	265	274	193	87	534	248	26	793
139	259	279	194	86	538	249	25	798
140	253	283	195	84	543	250	25	803
141	247	288	196	83	548	251	24	807
142	242	293	197	81	552	252	23	812
143	236	297	198	79	557	253	22	817
144	231	302	199	78	562	254	22	822
145	226	307	200	77	567	255	21	826
146	221	312	201	75	571	256	20	831
147	216	316	202	74	576	257	20	836
148	211	321	203	72	581	258	19	840
149	207	326	204	71	585	259	18	845
150	203	331	205	69	590	260	18	850
151	198	335	206	68	595	261	17	855
152	194	340	207	67	600	262	16	859
153	190	345	208	65	604	263	16	864
154	186	349	209	64	609	264	15	869
155	182	354	210	63	614	265	14	873
156	179	359	211	62	619	266	14	878
157	175	364	212	60	623	267	13	883
158	172	368	213	59	628	268	13	888
159	168	373	214	58	633	269	12	892

7.6.4. Cup Code 1537

Overrun / density table

Cup number = 1537
Cup weight = 78,2 g
Cup volume = 207,1 ml

Weight (g)	Overrun (%)	Density (g/l)	Weight (g)	Overrun (%)	Density (g/l)	Weight (g)	Overrun (%)	Density (g/l)
105	673	129	160	153	395	215	51	661
106	645	134	161	150	400	216	50	665
107	619	139	162	147	405	217	49	670
108	595	144	163	144	409	218	48	675
109	572	149	164	141	414	219	47	680
110	551	154	165	139	419	220	46	685
111	531	158	166	136	424	221	45	690
112	513	163	167	133	429	222	44	694
113	495	168	168	131	434	223	43	699
114	478	173	169	128	438	224	42	704
115	463	178	170	126	443	225	41	709
116	448	183	171	123	448	226	40	714
117	434	187	172	121	453	227	39	718
118	420	192	173	118	458	228	38	723
119	408	197	174	116	463	229	37	728
120	395	202	175	114	467	230	36	733
121	384	207	176	112	472	231	36	738
122	373	211	177	110	477	232	35	743
123	362	216	178	108	482	233	34	747
124	352	221	179	105	487	234	33	752
125	343	226	180	103	492	235	32	757
126	333	231	181	101	496	236	31	762
127	324	236	182	100	501	237	30	767
128	316	240	183	98	506	238	30	772
129	308	245	184	96	511	239	29	776
130	300	250	185	94	516	240	28	781
131	292	255	186	92	521	241	27	786
132	285	260	187	90	525	242	26	791
133	278	265	188	89	530	243	26	796
134	271	269	189	87	535	244	25	801
135	265	274	190	85	540	245	24	805
136	258	279	191	84	545	246	23	810
137	252	284	192	82	549	247	23	815
138	246	289	193	80	554	248	22	820
139	241	294	194	79	559	249	21	825
140	235	298	195	77	564	250	21	830
141	230	303	196	76	569	251	20	834
142	225	308	197	74	574	252	19	839
143	220	313	198	73	578	253	18	844
144	215	318	199	71	583	254	18	849
145	210	323	200	70	588	255	17	854
146	205	327	201	69	593	256	16	859
147	201	332	202	67	598	257	16	863
148	197	337	203	66	603	258	15	868
149	193	342	204	65	607	259	15	873
150	188	347	205	63	612	260	14	878
151	184	352	206	62	617	261	13	883
152	181	356	207	61	622	262	13	887
153	177	361	208	60	627	263	12	892
154	173	366	209	58	632	264	11	897
155	170	371	210	57	636	265	11	902
156	166	376	211	56	641	266	10	907
157	163	380	212	55	646	267	10	912
158	160	385	213	54	651	268	9	916
159	156	390	214	53	656	269	9	921

7.7. Decoration properties photos

7.7.1. Whipped cream premix stored at 21°C from various storage times

7.7.1.1. Week 0
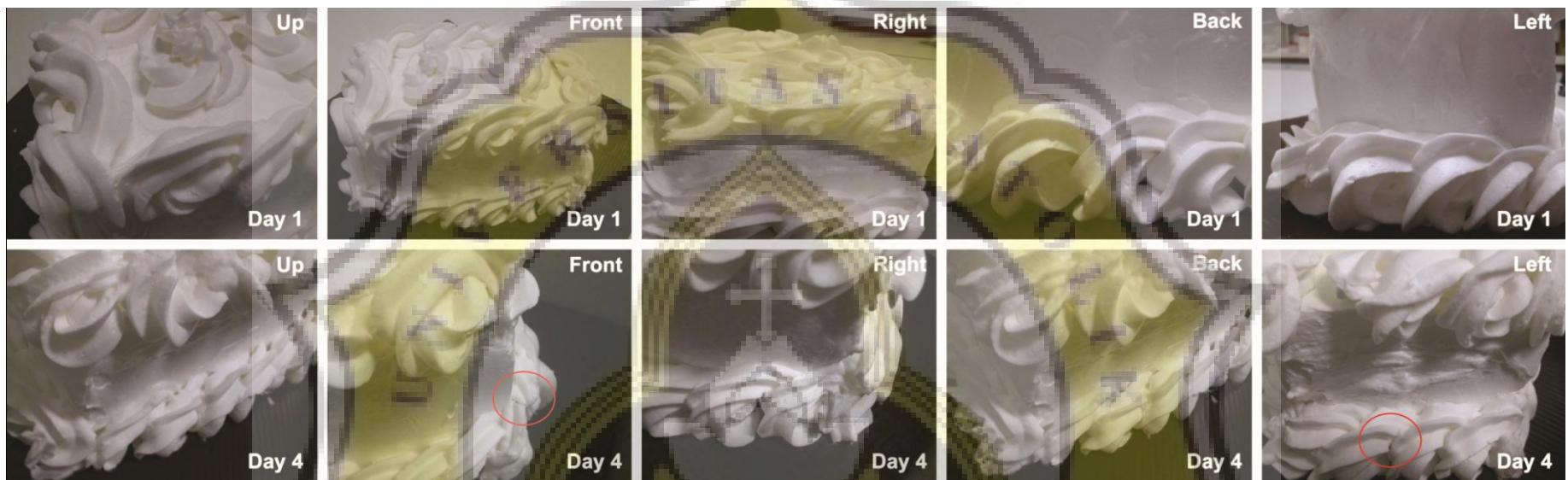


Figure 24 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on Day 1 and Day 4.

7.7.1.2. Week 2
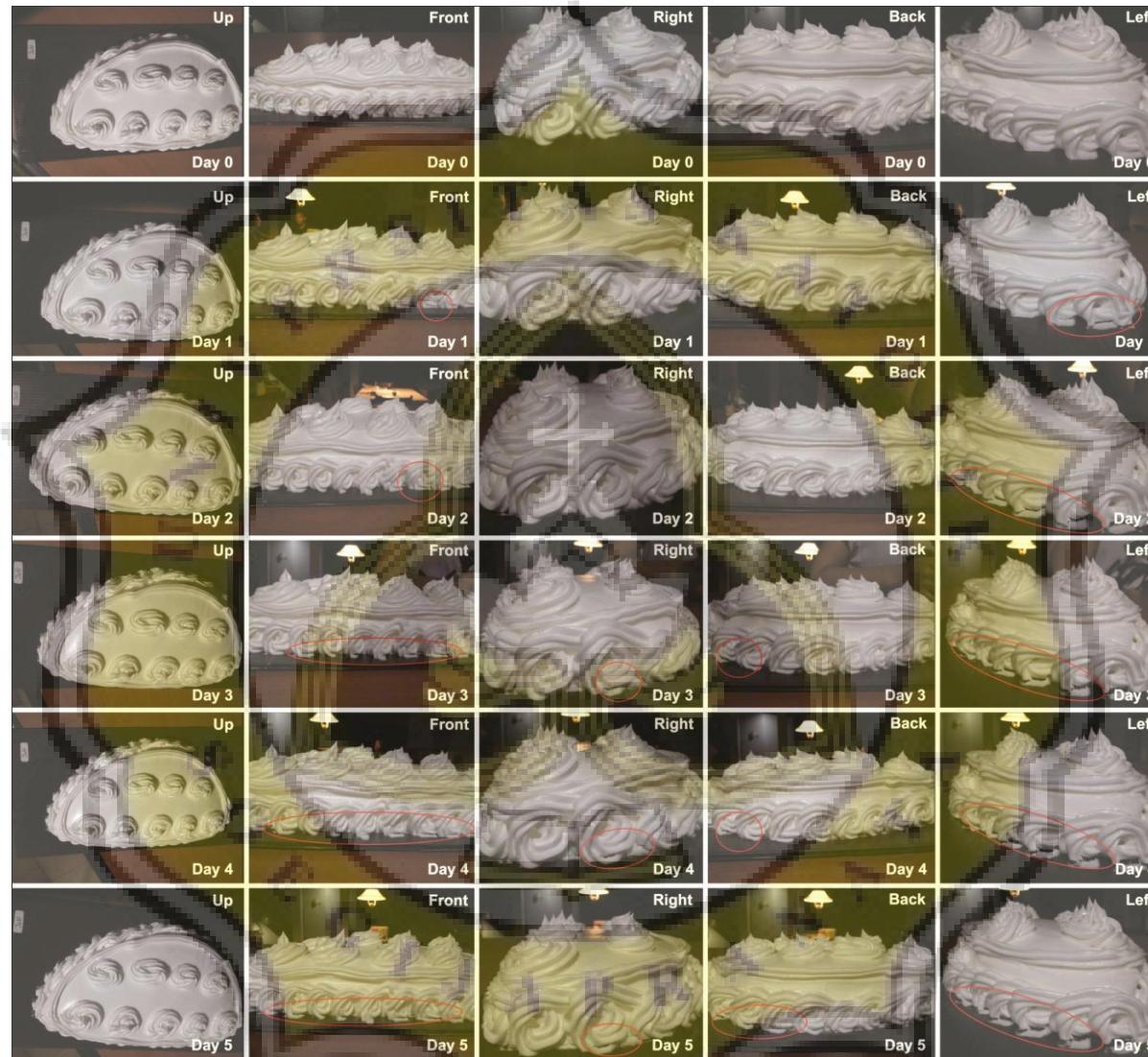
Figure 25 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

7.7.1.3. Week 4

Figure 26 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 5 days.

7.7.1.4. Week 6
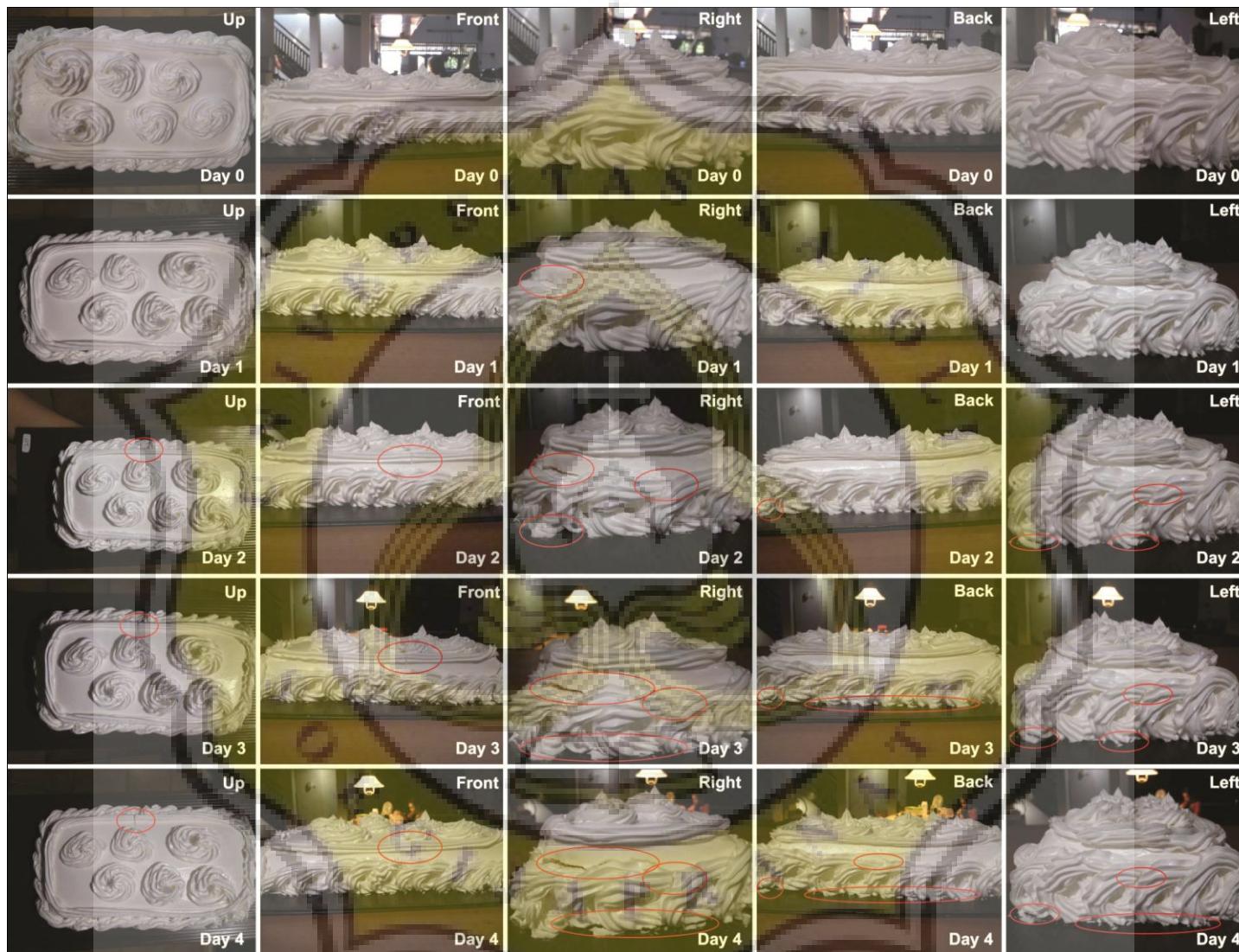
Figure 27 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 5 days.

7.7.1.5. Week 8
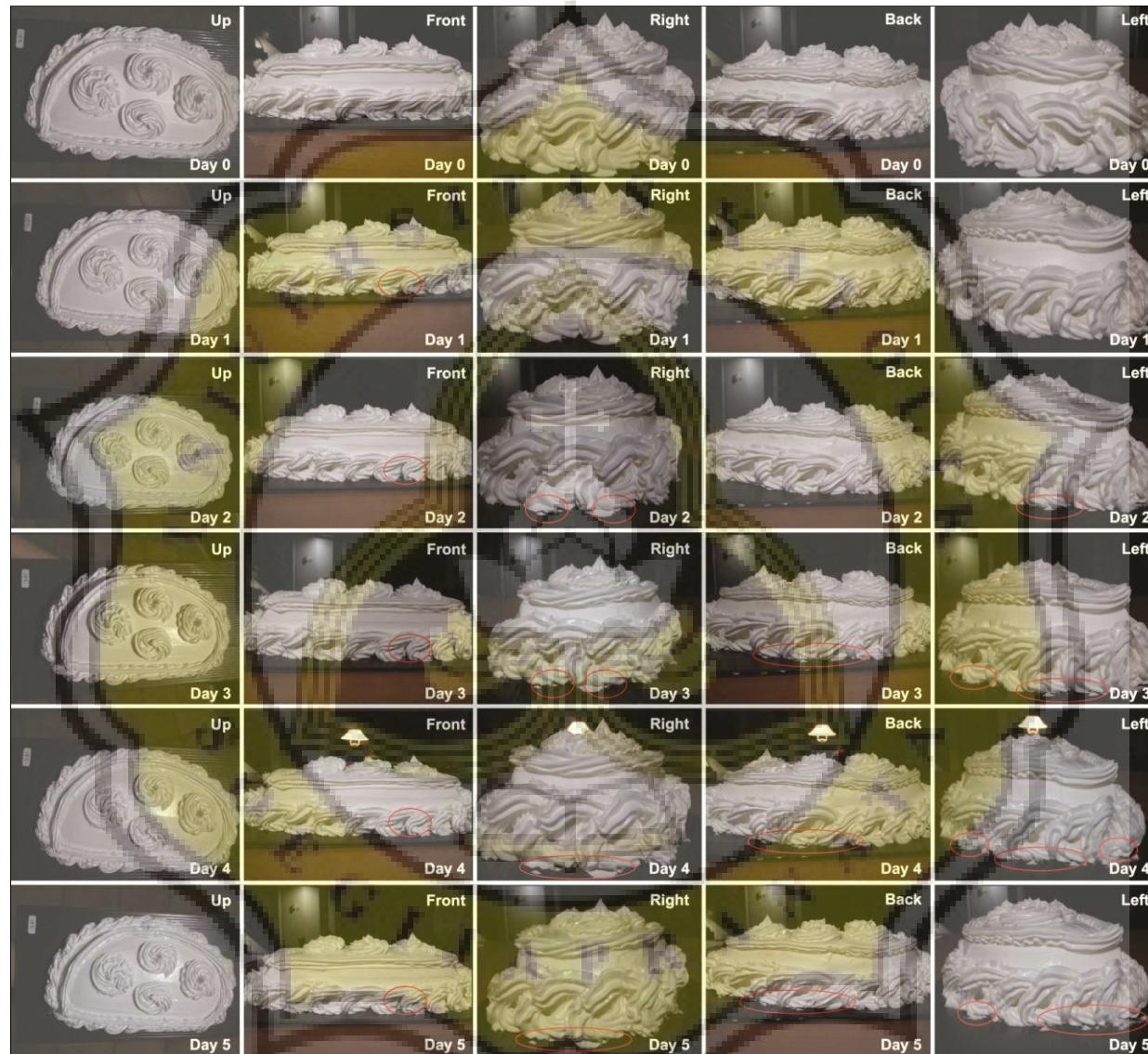
Figure 28 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

7.7.1.6. Week 10
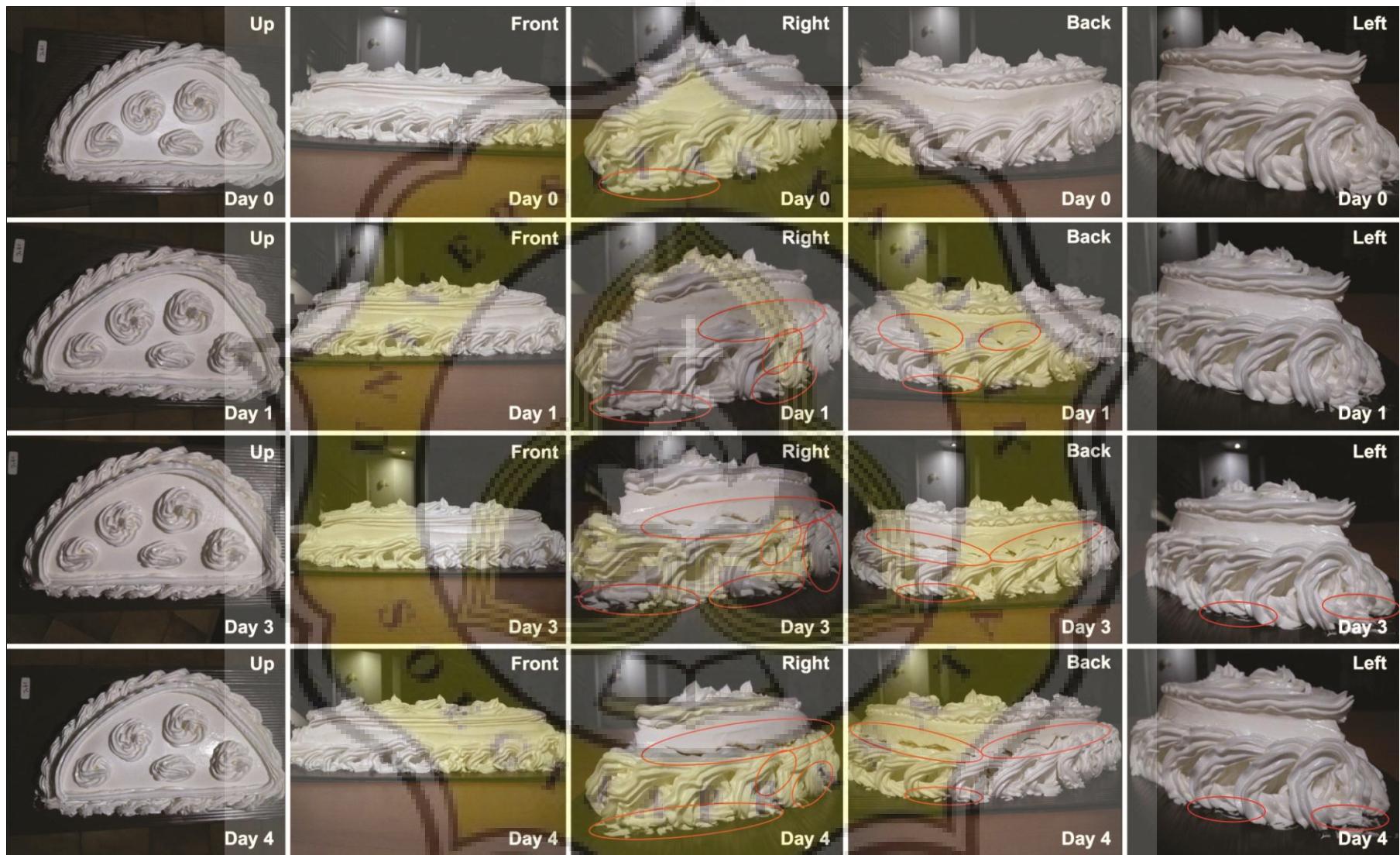
Figure 29 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 0, 1, 3 and 4.

7.7.1.7. Week 12

Figure 30 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 1-5.

7.7.2. Whipped cream premix stored at 27°C from various storage times

7.7.2.1. Week 0
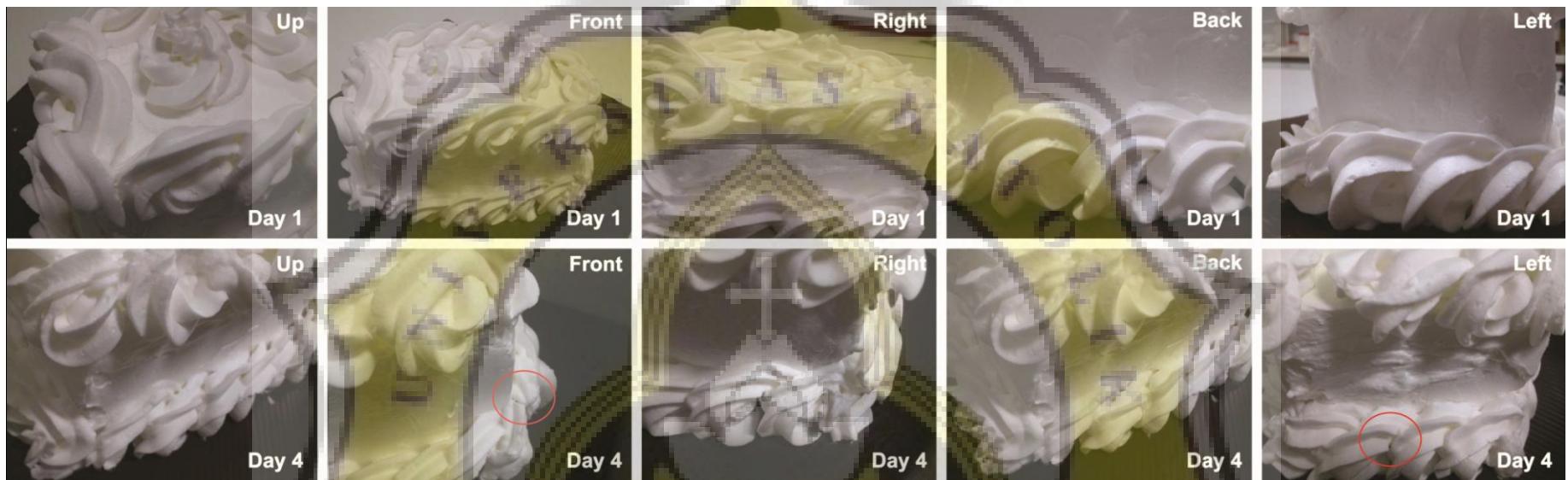
Figure 31 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 1 and 4.

7.7.2.2. Week 2

Figure 32 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

7.7.2.3. Week 4



Figure 33 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.
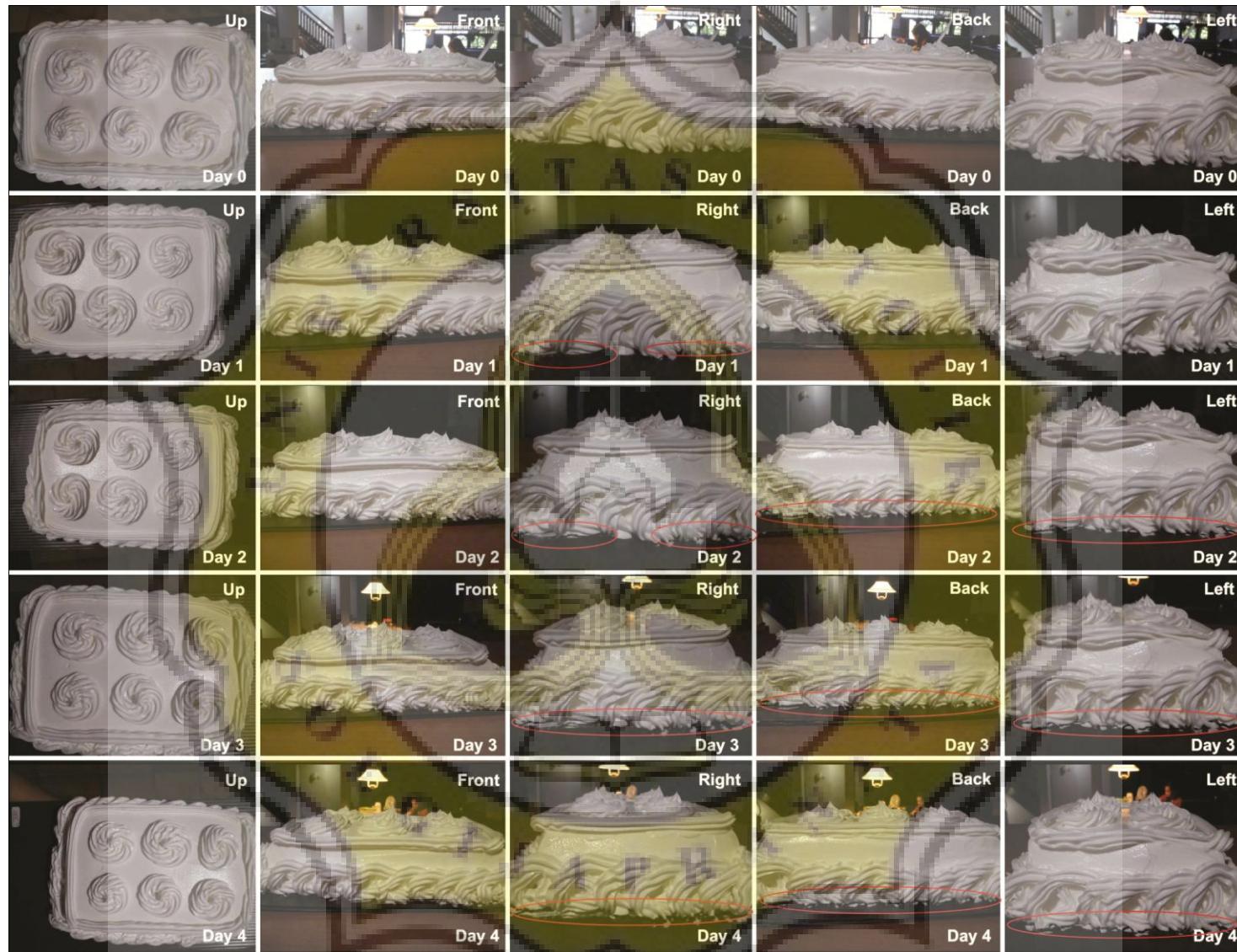
Figure 34 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 5 days.

7.7.2.5. Week 8
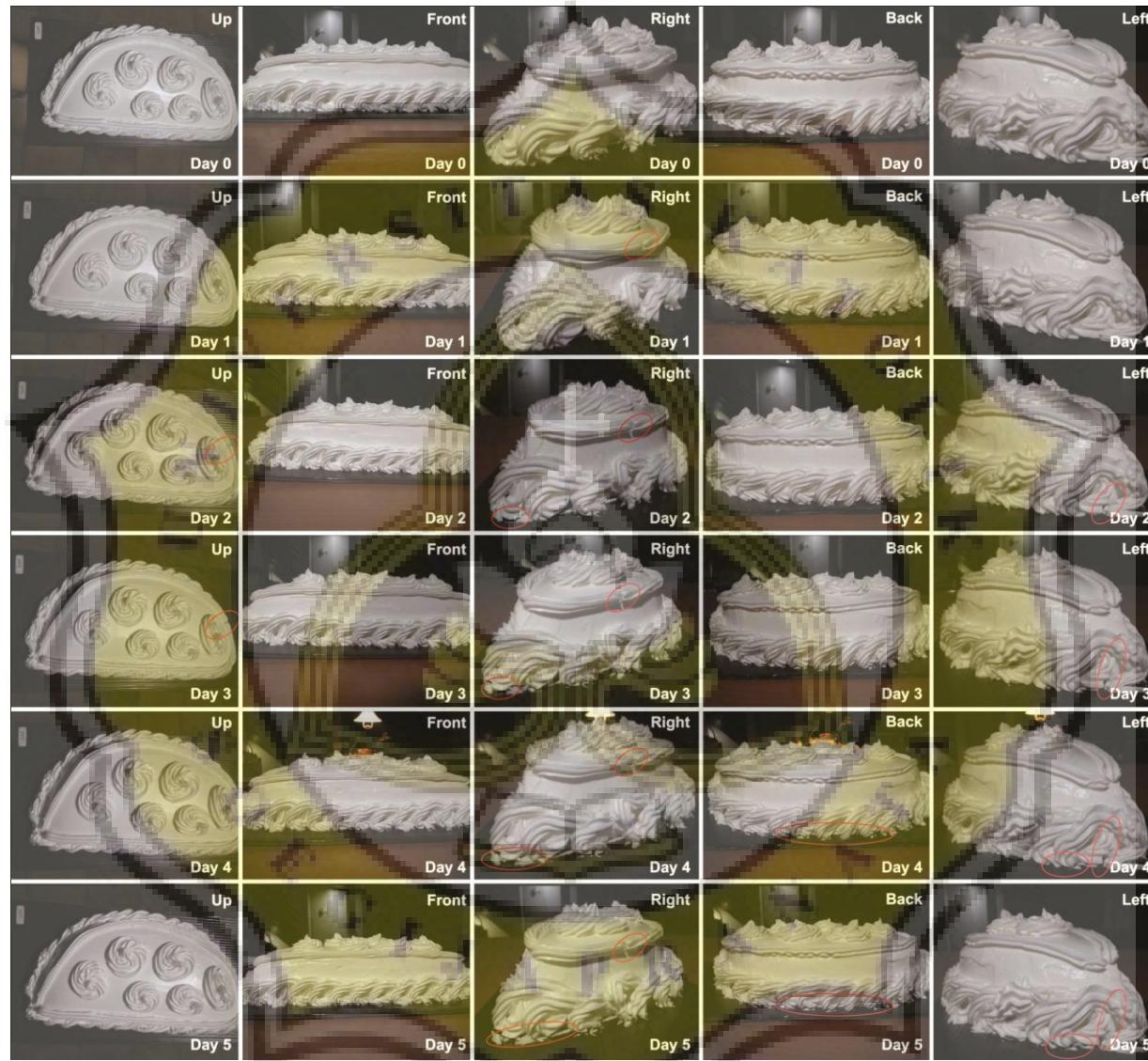
Figure 35 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

7.7.2.6.   Week 10
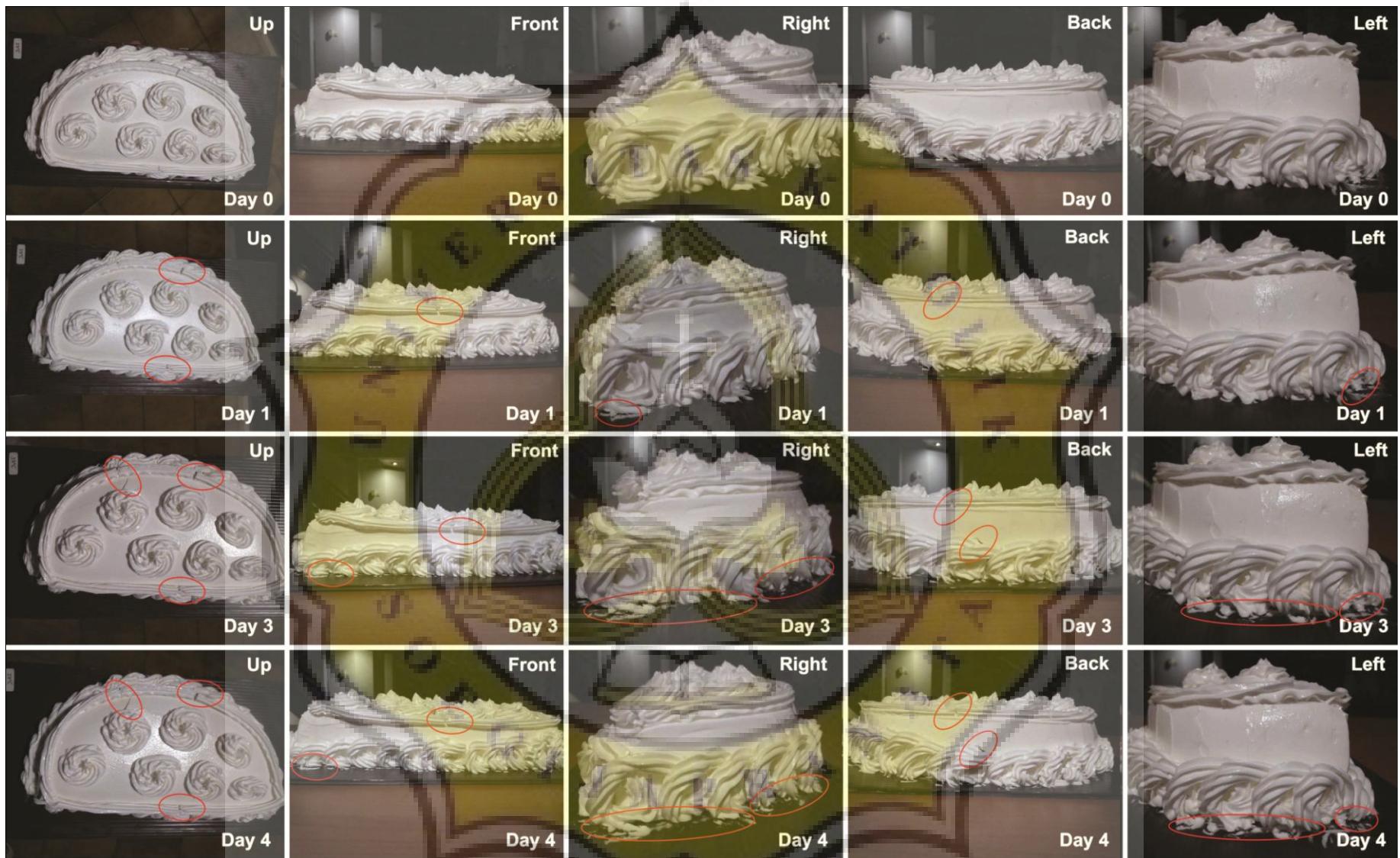

Figure 36 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 0, 1, 3, 4.

7.7.2.7. Week 12

Figure 37 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 1-5.

7.7.3. Whipped cream premix stored at 37°C from various storage time

7.7.3.1. Week 0
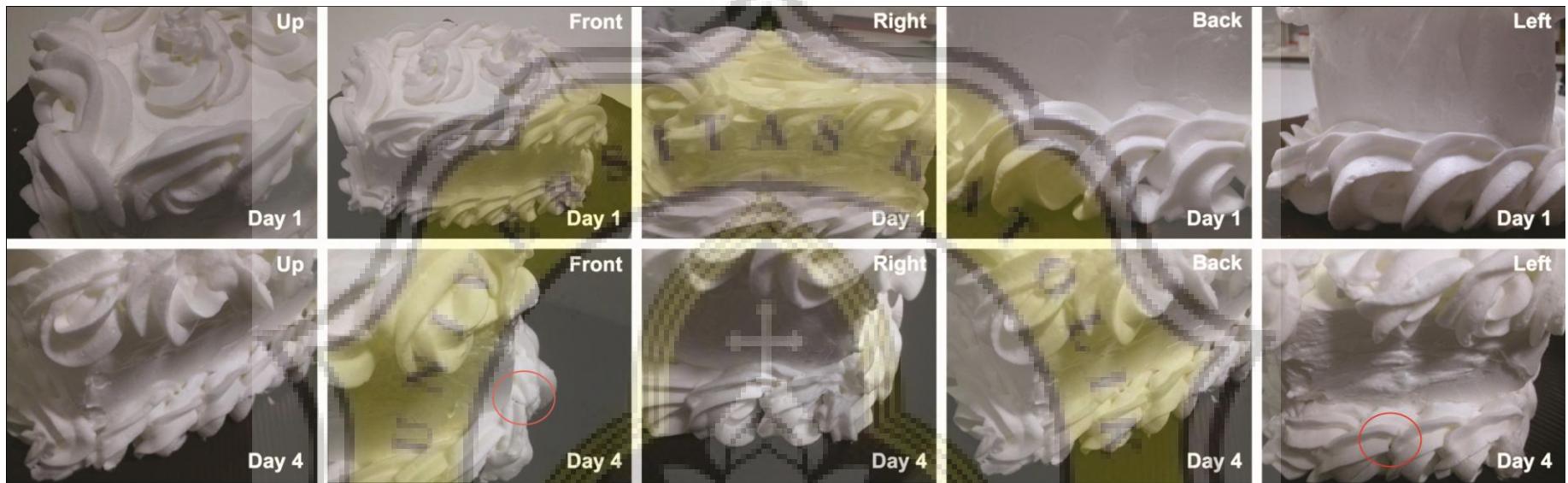
Figure 38 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 1 and 4.
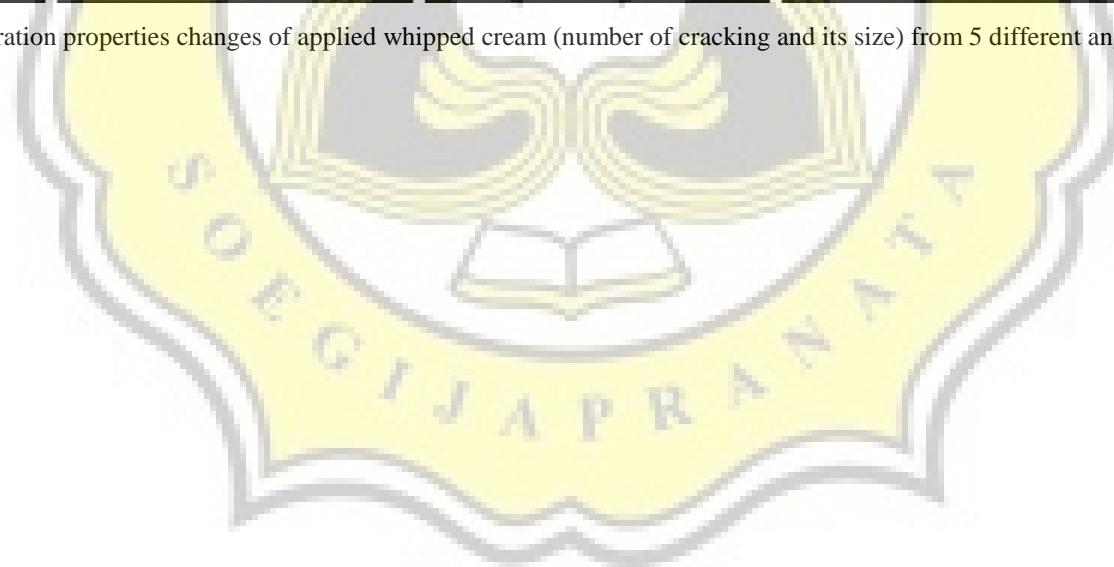
7.7.3.2. Week 1
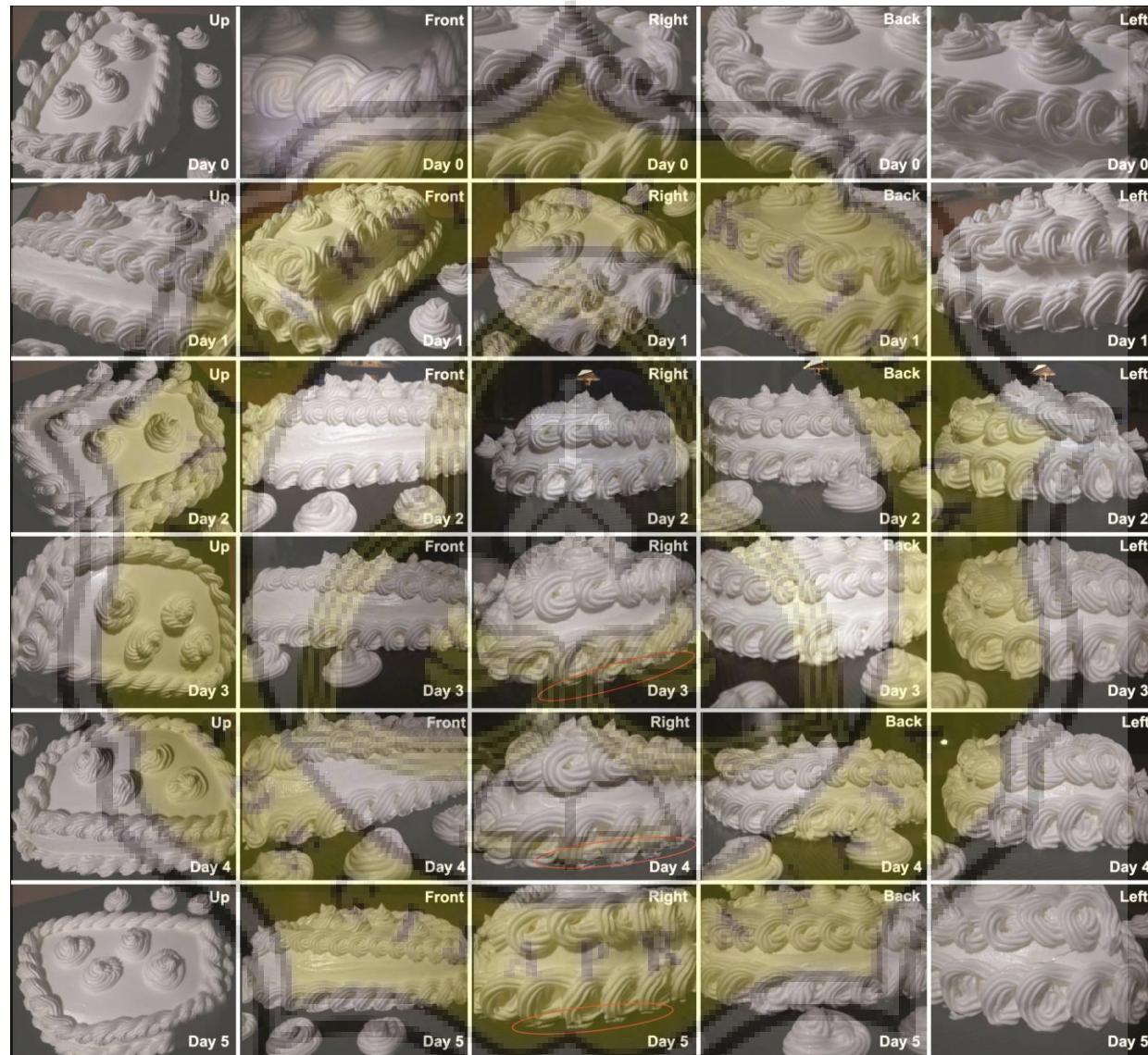
Figure 39 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

7.7.3.3. Week 2
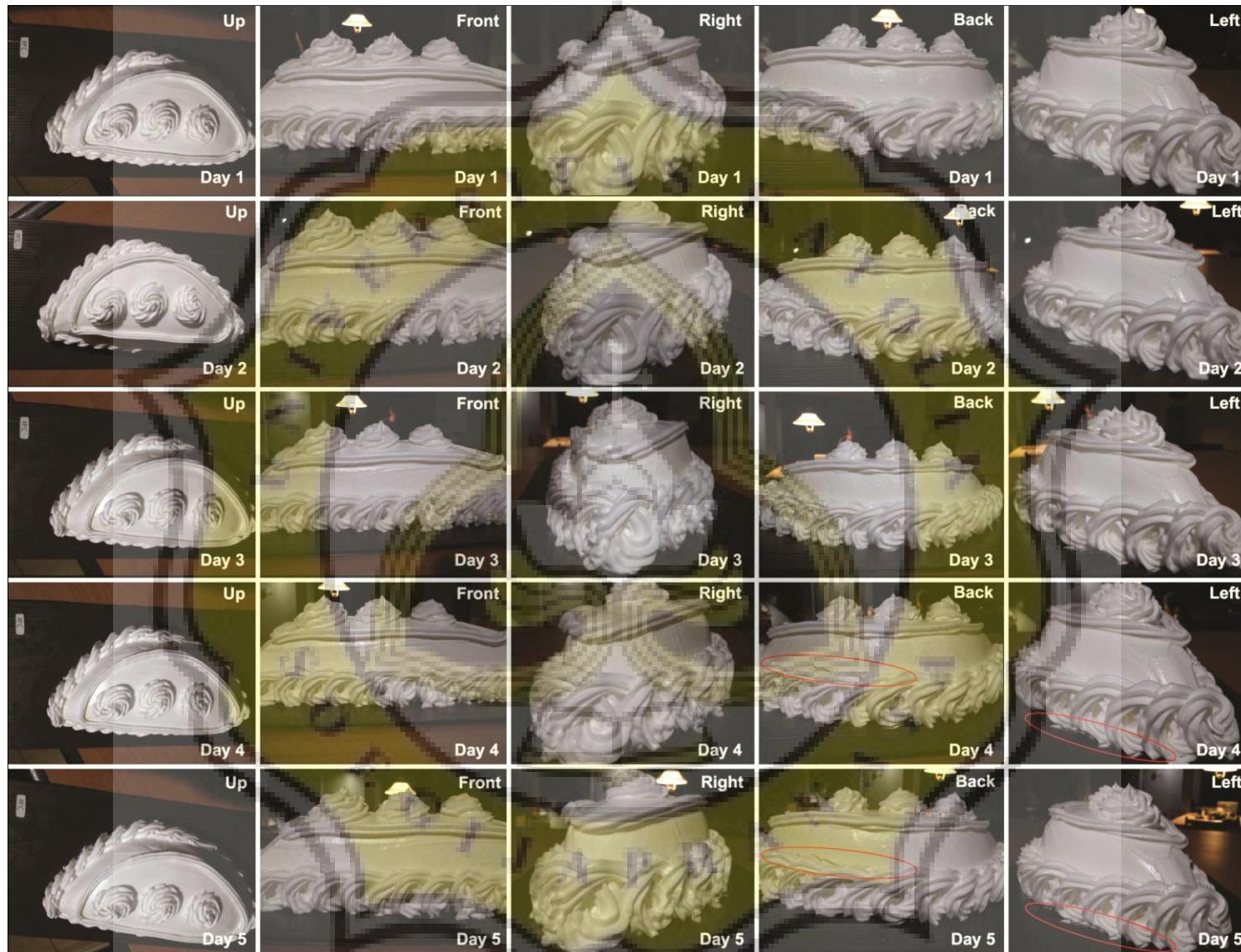
Figure 40 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 1-5.

7.7.3.4. Week 3

Figure 41 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed on day 0, 1, 3, 4, 5.

7.7.3.5. Week 4

Figure 42 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

7.7.3.6. Week 5

Figure 43 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 6 days.

Figure 44 Photos of decoration properties changes of applied whipped cream (number of cracking and its size) from 5 different angles. Observed in 5 days.