

## DAFTAR PUSTAKA

- Adiah Abdul Hakim, H. S., Selamat, J., & Mirhosseini, S. H. (2019). Sensory Preference And Bloom Stability Of Chocolate Containing Cocoa Butter Substitute From Coconut Oil. *Saudi Soc. Agric. Sci*, 18(4), 443–448. <https://doi.org/10.1016/J.Jssas.2018.02.005>
- Afoakwa, E. O. (2010). *Chocolate Science And Technology*. Times By Aptara Inc.
- Afoakwa, E. O. (2014). *Cocoa Production And Processing Technology* (Pp. 183–195). Crc Press Taylor & Francis Group.
- Afoakwa, E. O. (2016). *Chocolate Science And Technology*. John Willey & Sons.
- Aprida, P., Suprayatmi, M., & Hutami, M. (2017). Pendugaan Umur Simpan Susu Bubuk Full Cream Yang Dikemas Dengan Aluminium Foil (Al7) Atau Metalized Plastic (Vm-Pet12). *Jurnal Agroindustri Halal*, 3(2), 97–104.
- Barrile, J. C., Osrovar, K., & Keeney, P. G. (1971). Microflora Of Cocoa Beans Before And After Roasting At 150 C. *Journal Of Milk Food Technology*, 34(7), 369–371. <https://doi.org/10.4315/0022-2747-34.7.369>
- Beckett, S. T. (2000). *The Science Of Chocolate First Edition* (First). Rsc Paperbacks.
- Beckett, S. T. (2001). The Science Of Chocolate: Second Edition. In *Choice Reviews Online* (Vol. 38, Issue 06). <https://doi.org/10.5860/Choice.38-3330>
- Beckett, S. T. (Ed.). (2009). *Industrial Chocolate Manufacture And Use Fourth Edition* (Fourth). John Wiley & Sons.
- Biehl, B., & Ziegleder, G. (2003). Cocoa – Chemistry Of Processing/Production, Products, And Use. In B. Caballero (Ed.), *Encyclopedia Of Food Science And Nutrition* (Vol. 3). Academic Press.
- Čopíková, J. (1999). *Technologie Čokolády A Cukrovinek (Technology Of Chocolate And Confectionery)* (First). Všcht.
- Decker, W., Roy, D., Voght, C., Roy, C., & Dabbert, P. (2019). Metallized Polymer Films As Replacement For Aluminum Foil In Packaging Applications. *47th Annual Technical Conference Proceedings, April 2004*.
- Dhonsi, D., & Stapley, A. G. F. (2006). The Effect Of Shear Rate, Temperature, Sugar And Emulsifier On The Tempering Of Cocoa Butter. *Journal Of Food Engineering*, 77(4). <https://doi.org/10.1016/J.Jfoodeng.2005.08.022>
- Eskin, M., & Robinson, D. S. (Eds.). (2001). *Food Shelf Life Stability: Chemical, Biochemical And Microbial Chages*. Crc Press. [https://books.google.co.id/books?hl=id&lr=&id=Pdhpbwaaqbaj&oi=fnd&pg=pp1&dq=Eskin,+M+Da+n+D.+Robinson.+2001.+Food+Shelf+Life+Stability:Chemical,+Biochemical+And+Microbial+Chages.+Crc+Press,+Danvers+Usa.&ots=1v18wjvuj&sig=Xvbgfdxvwgwg5mg7cbhpjrozava&redir\\_](https://books.google.co.id/books?hl=id&lr=&id=Pdhpbwaaqbaj&oi=fnd&pg=pp1&dq=Eskin,+M+Da+n+D.+Robinson.+2001.+Food+Shelf+Life+Stability:Chemical,+Biochemical+And+Microbial+Chages.+Crc+Press,+Danvers+Usa.&ots=1v18wjvuj&sig=Xvbgfdxvwgwg5mg7cbhpjrozava&redir_)
- Gabis, D. A., Langlois, B. E., & Rudnick, A. W. (1970). *Microbiological Examination Of Cocoa Powder* 1. 20(4), 644–645.
- Halmia. (2021). *Studi Pembuatan Dark Chocolate Dengan Penambahan Bahan Pengisi Biji Kenari Kering (Canarium Indicum L.) Terhadap Uji Organoleptik Dan Sifat Fisikokimia Produk*. 1–22.
- Hartuti, S., & Rita Khathir, Dan. (2020). Kopelma Darussalam-Banda Aceh 23111, Indonesia. 2 Program Studi Teknologi Hasil Pertanian. *Universitas Syiah Kuala. Jl. Tgk. Hasan Krueng Kalee*, 15(3), 38–52. <http://202.47.80.55/Bbihp/Article/View/6318>
- Hasrini, R. F., & Wardyanie, N. I. A. (2020). Perbandingan Karakteristik Fisikokimia Antara Cocoa Butter Alternative (Cba) Dengan Lemak Kakao Untuk Pengembangan Standar Nasional Indonesia. *Jurnal Standardisasi*, 22(3), 189. <https://doi.org/10.31153/Js.V22i3.838>
- Hong, B., Zhang, L., Zheng, J., Sullivan, M. B., You, Z., Kriegel, R., & Moffitt, R. (2018). Fast Estimation Of

- Sorption Of Organic Compounds In Polymeric Packaging Materials. *Food Packaging And Shelf Life*, 16, 97–102. <https://doi.org/10.1016/j.fpsl.2018.02.005>
- Iacumin, L., Pellegrini, M., Colautti, A., Orecchia, E., & Comi, G. (2022). Microbial Characterization Of Retail Cocoa Powders And Chocolate Bars Of Five Brands Sold In Italian Supermarkets. *Foods*, 11(18). <https://doi.org/10.3390/foods11182753>
- Indiarto, R., Inayah, D. N., Ramadhani, A. P., & Yarlina, V. P. (2021). Chocolate's Blooming Phenomenon: A Brief Review Of The Formation Process And Its Influencing Factors. *International Journal Of Emerging Trends In Engineering Research*, 9(8), 1156–1161. <https://doi.org/10.30534/ijeter/2021/21982021>
- Isyanti, M., Sudibyo, A., Supriatna, D., & Suherman, H. (2015). Use Of Various Cocoa Butter Substitute (Cbs) Hydrogenated In Making Chocolate Bar Mirna. *Journal Of Agro-Based Industry*, 32(1), 33–44.
- Januszczyńska, R. (2018). *Hidden Persuaders In Cocoa And Chocolate*. <https://www.barry-callebaut.com/en-us/manufacturers/trends-insights/lets-talk-taste#:~:text=Taste%3a Sweetness%2c Sourness%2c Bitterness,Mouthfeel%3a Creamy%2c Melting%2c Astringent>
- Lima, L., Kamphuis, H., & Zwietering, M. (2011). Microbiota Of Cocoa Powder With Particular Reference To Aerobic Thermoresistant Spore-Formers. *Food Microbiology*, 28(3), 573–582. <https://www.sciencedirect.com/science/article/abs/pii/S0740002010002935?via%3dihub>
- Limbaro, R. P., Santoso, H., & Witono, J. R. (2017). The Effect Of Coconut Oil And Palm Oil As Substituted Oils To Cocoa Butter On Chocolate Bar Texture And Melting Point. *Aip*. <https://doi.org/10.1063/1.4982281>
- Liu, W., Yao, Y., & Li, C. (2022). Effect Of Tempered Procedures On The Crystallization Behavior Of Different Positions Of Cocoa Butter Products. *Food Chemistry*, 370(February 2021), 131002. <https://doi.org/10.1016/j.foodchem.2021.131002>
- Lonchampt, P., & Hartel, R. W. (2004). Fat Bloom In Chocolate And Compound Coatings. *European Journal Of Lipid Science And Technology*, 106(4), 241–274. <https://doi.org/10.1002/ejlt.200400938>
- Lonchampt, P., & Martel, R. W. (2006). Surface Bloom On Improperly Tempered Chocolate. *European Journal Of Lipid Science And Technology*, 108(2), 159–168. <https://doi.org/10.1002/ejlt.200500260>
- Machálková, L., Hřivná, L., Nedomová, Š., & Jůzl, M. (2015). The Effect Of Storage Temperature On The Quality And Formation Of Blooming Defects In Chocolate Confectionery. *Potravinárstvo*, 9(1), 39–47. <https://doi.org/10.5219/425>
- Marwati, T., Lesmaningsih, A., & Djaafar, T. F. (2019). Kajian Teknologi Pengemasan Bubuk Dan Permen Cokelat Di Tpp Nglangeran Yogyakarta. *Research Fair Unisri*, 663–670.
- Masyitah, N., Sumiwi, A., & Wilar, G. (2018). Khasiat Kacang Kenari (*Canarium Indicum* L.) Terhadap Berbagai Macam Penyakit. *Farmaka*, 16(3), 10–13.
- Mazigh, D. (1994). *Microbiology Of Chocolate: In Industrial Chocolate Manufacture And Use*. Academic Press.
- Metin, S., & Hartel, R. W. (2005). Crystallization Of Fats And Oils. *Bailey's Industrial Oil And Fat Products*, 1(2). <https://doi.org/10.1002/047167849x.bio021>
- Mulato, S., Widoyotomo, Misnawati, Sanali, & E, S. (2004). *Petunjuk Teknis Pengolahan Produk Primer Dan Sekunder Kakao* (Kakao, Bag). Pusat Penelitian Kopi Dan Kakao Indonesia.
- Napitupulu, H. G., Rumengan, I. F. M., Wullur, S., Ginting, E. L., Rimper, J. R. T. S. L., & Toloh, B. H. (2019). *Bacillus* Sp. As A Decomposition Agent In The Maintenance Of *Brachionus Rotundiformis* Which Uses Raw Fish As A Source Of Nutrition. *Jurnal Ilmiah Platax*, 7(1), 158. <https://doi.org/10.35800/jip.7.1.2019.22627>
- Nugraheni, M. (2018). Kemasan Pangan. In *Plantaxia*.
- Nurani, D., Sukmadi, I., & Hidayat, N. (2017). *Kualitas Barrier Kemasan Fleksibel Berbasis Metalized Film*

Untuk Produk Pangan (Pp. 55–61).

- Pinto, G., Taylor-Roseman, R., & Cogan, K. (2021). *Evaluation Of The Thermal Inactivation Of A Salmonella Serotype Oranienburg Strain During Cocoa Roasting At Conditions Relevant To The Fine Chocolate Industry*. 12(March). <https://doi.org/10.3389/Fmicb.2021.576337>
- Purwanto, I. J., & Santosa, E. (2016). Hubungan Mutu Buah Dan Curah Hujan Terhadap Kandungan Asam Lemak Bebas Pada Minyak Kelapa Sawit. *Buletin Agrohorti*, 4(3), 250–255. <https://doi.org/10.29244/Agrob.V4i3.14264>
- Ramlah, S. (2016). Karakteristik Mutu Dan Citarasa Cokelat Kaya Polifenol. *Jurnal Industri Hasil Perkebunan*, 11(1), 23. <https://doi.org/10.33104/Jihp.V11i1.3553>
- Rašper, V. (1963). *Technologie Čokolády A Cukrovinek, (Technology Of Chocolate And Confectionery)*. Všcht.
- Retnani, Y., Kurniawan, D., Yusawisana, S., & Herawati, L. (2010). Kerusakan Lemak Ransum Ayam Broiler Yang Menggunakan. *Jitp*, 1(1), 1–11.
- Robert Tucker, C. (2004). Thermal Spray Coating. *Surface Engineering*, 497–507.
- Sampurno, R. B. (2006). Aplikasi Polimer Dalam Industri Kemasan. *Jurnal Sains Materi Indonesia*, 15–22.
- Schenk, H., & Peschar, R. (2004). Understanding The Structure Of Chocolate. *Radiation Physics And Chemistry*, 71(3–4), 829–835. <https://doi.org/10.1016/J.Radphyschem.2004.04.105>
- Sopianti, D. S., Herlina, & Saputra, H. T. (2017). Penetapan Kadar Asam Lemak Bebas Pada Minyak Goreng. *Jurnal Katalisator*, 2(2), 100–105. <http://doi.org/10.22216/Jk.V2i2.2408>
- Stortz, T. A., & Marangoni, A. G. (2011). Heat Resistant Chocolate. *Trends In Food Science And Technology*, 22(5), 201–214. <https://doi.org/10.1016/J.Tifs.2011.02.001>
- Subandrio, S. (2018). Aplikasi Proses Tempering Untuk Optimalisasi Titik Leleh Cokelat Hitam Produk Pengolahan Pintas. *Jurnal Teknologi Industri Pertanian*, 28(3), 262–268. <https://doi.org/10.24961/J.Tek.Ind.Pert.2018.28.3.262>
- Sucipta, I. N., Suriasih, K., & Kenacana, P. K. D. (2017). Pengemasan Pangan Kajian Pengemasan Yang Aman, Nyaman, Efektif Dan Efisien. *Udayana University Press*, 1–178.
- Suyitno. (1990). *Bahan-Bahan Pengemas (Pau)*. Ugm.
- Tisoncik, M. (2013). Chocolate Fat Bloom. *The Manufacturing Confectioner*, April, 65–68. [http://www.blommer.com/\\_documents/chocolate-fat-bloom-article.pdf](http://www.blommer.com/_documents/chocolate-fat-bloom-article.pdf)
- Utami, R. R. (2013). *Antioksidan Biji Kakao: Pengaruh Fermentasi Dan Penyangraian Terhadap Perubahannya ( Ulasan ) Cocoa Antioxidant: Effect Of Fermentation And Roasting On Antioxidant Change ( Review )*. 75–85.
- Wang, F., Liu, Y., Shan, L., Jin, Q., Wang, X., & Li, L. (2010). Blooming In Cocoa Butter Substitutes Based Compound Chocolate: Investigations On Composition, Morphology And Melting Behavior. *Jaocs. J. Am. Oil Chem Soc.*, 87(10), 1137–1143. <https://doi.org/10.1007/S11746-010-1604-Z>.
- Willige, R. W. G. Van. (2002). *Effects Of Flavour Absorption On Foods And Their Packaging Materials*. <https://library.wur.nl/webquery/wurpubs/318502>
- Zhao, H., & James, B. J. (2018). Fat Bloom Formation On Model Chocolate Stored Under Steady And Cycling Temperatures. *J. Food Eng.*
- Ziegleder, G. (2009). Flavour Development In Cocoa And Chocolate. In S. T. Beckett (Ed.), *Industrial Chocolate Manufacture And Use* (P. 170). John Wiley & Sons.

## LAMPIRAN

### Lampiran 1. Hasil Analisis Total Plate Count Olahan Cokelat Setelah Penyimpanan

| Sampel Cokelat | Pengenceran      | Cawan  |        |        | Jumlah Koloni Rata-Rata | Koloni/g(mL)           | Log CFU/g(mL) |
|----------------|------------------|--------|--------|--------|-------------------------|------------------------|---------------|
|                |                  | I      | II     | III    |                         |                        |               |
| Aluminium Foil | 10 <sup>-1</sup> | 1      | 1<br>6 | 1      | 6                       | 6 x 10 <sup>1</sup>    | 1,77          |
|                | 10 <sup>-2</sup> | 6      | 1      | 5      | -                       |                        |               |
|                | 10 <sup>-3</sup> | 0      | 2      | 1      | -                       |                        |               |
| Metalize Film  | 10 <sup>-1</sup> | 1<br>4 | 1      | 2<br>2 | 12,3                    | 1,23 x 10 <sup>2</sup> | 2,08          |
|                | 10 <sup>-2</sup> | 3      | 1      | 5      | -                       |                        |               |
|                | 10 <sup>-3</sup> | 1      | 1      | 0      | -                       |                        |               |

Syarat perhitungan dari angka lempeng total sesuai MA.85/MIK/ 06 adalah:

1. Mikroba yang dapat dihitung 30-300 koloni
2. >30 koloni, dianggap cemaran
3. <300 koloni, spreader atau tak terhingga sehingga tak dapat dihitung
4. Jumlah bakteri adalah jumlah koloni x faktor pengenceran
5. Perbandingan jumlah bakteri dari pengenceran berturut-turut antara pengenceran yang akhir dengan pengenceran yang sebelumnya
6. Jika sama atau kurang dari 2 maka hasilnya dirata-rata. Jika lebih dari 2 digunakan pengenceran sebelumnya.

#### Perhitungan Angka Lempeng Total (ALT)

$$\text{Rumus ALT} = \left[ \frac{\Sigma C}{(1 \times n1) + (0,1 \times n2) + (0,01 \times n3) \times d} \right]$$

Keterangan:

$\Sigma C$  = Jumlah koloni yang memenuhi syarat

n1 = Jumlah cawan pada pengenceran pertama yang memenuhi syarat

n2 = Jumlah cawan pada pengenceran kedua yang memenuhi syarat

n3 = Jumlah cawan pada pengenceran ketiga yang memenuhi syarat

d = Nilai pengenceran pertama yang memenuhi syarat

#### A. Cokelat yang dikemas dengan Metalize Film

$$\text{ALT:} \left[ \frac{\Sigma C}{(1 \times n1) + (0,1 \times n2) + (0,01 \times n3) \times d} \right]$$

$$\text{ALT} = \frac{22 + 1 + 14}{(1 \times 3) \times 10^{-1}}$$

$$= \frac{37}{3 \times 10^{-1}}$$

$$= 12,33 \times 10^1$$

$$= 1,23 \times 10^2 \text{ koloni/g}$$

B. Cokelat yang dikemas dengan Aluminium Foil

$$\text{ALT:} \left[ \frac{\Sigma C}{(1 \times n_1) + (0,1 \times n_2) + (0,01 \times n_3) \times d} \right]$$

$$\begin{aligned} \text{ALT} &= \frac{1 + 16 + 1}{(1 \times 3) \times 10^{-1}} \\ &= \frac{18}{3 \times 10^{-1}} \\ &= 6 \times 10^1 \text{ * koloni/g} \end{aligned}$$

Keterangan:

- Jumlah koloni pada sampel cokelat kemasan metalize film yang memenuhi syarat rentang 30-300 koloni, hanya ada pada satu pengenceran, yaitu hanya pada pengenceran pertama/terendah. Sehingga hanya itu yang diambil dalam perhitungan.
- Jumlah semua koloni pada semua sampel cokelat kemasan aluminium foil kurang dari 25 Sehingga perhitungan ALT hanya diambil dari hasil pengenceran terendah.
- Tanda (\*) menandakan diluar syarat jumlah koloni 30-300.

## Lampiran 2. Hasil Analisis Asam Lemak Bebas Olahan Cokelat Setelah Penyimpanan

| Sampel Cokelat | Triplo          | Bobot Sampel (gram) | BM Asam Lemak Palmitat | N NaOH | V NaOH (mL) | ALB (%) |
|----------------|-----------------|---------------------|------------------------|--------|-------------|---------|
| Aluminium Foil | 1               | 5,01                | 256,42                 | 0,022  | 10,05       | 1,13    |
|                | 2               | 5,02                | 256,42                 | 0,022  | 10,15       | 1,14    |
|                | 3               | 5,07                | 256,42                 | 0,022  | 10,40       | 1,15    |
|                | Rerata          |                     |                        |        |             | 1,14    |
|                | Standar Deviasi |                     |                        |        |             | 0,008   |
| Metalize Film  | 1               | 5,09                | 256,42                 | 0,022  | 10,95       | 1,21    |
|                | 2               | 5,05                | 256,42                 | 0,022  | 10,95       | 1,22    |
|                | 3               | 5,01                | 256,42                 | 0,022  | 10,10       | 1,13    |
|                | Rerata          |                     |                        |        |             | 1,19    |
|                | Standar Deviasi |                     |                        |        |             | 0,040   |

### Perhitungan Kadar Asam Lemak Bebas

$$\% \text{ALB} = \frac{mL \text{ NaOH} \times N \times M}{W \times 1000} \times 100$$

Keterangan:

%ALB = Kadar asam lemak bebas dalam bentuk persen (%)

mL NaOH = Volume titran NaOH

N = Normalitas larutan NaOH

M = Berat molekul asam lemak (cokelat mengandung asam palmitat 256,42)

W = Berat sampel (gram)

Contoh Perhitungan:

$$\begin{aligned} \% \text{ALB} &= \frac{10,05 \times 0,022 \times 256,42}{5,01 \times 1000} \times 100 \\ &= \frac{56,69}{5,010} \times 100 \\ &= \frac{5,669}{5,010} \\ &= 1,13 \end{aligned}$$

### Hasil Analisis Data Uji T Asam Lemak Bebas pada Cokelat Hitam

| Independent Samples Test |                             |   |      |                              |       |                 |                 |   |         |        |
|--------------------------|-----------------------------|---|------|------------------------------|-------|-----------------|-----------------|---|---------|--------|
|                          |                             | Levene's Test for Equality of Variances |      | t-Test for Equality of Means |       |                 |                 | 95% Confidence Interval of the Difference |         |        |
|                          |                             | F                                       | Sig. | t                            | df    | Sig. (2-tailed) | Mean Difference | Std. Error Difference                     | Lower   | Upper  |
| Asam Lemak Bebas         | Equal variances assumed     | 8,909                                   | .041 | -1,606                       | 4     | .184            | -.04667         | .02906                                    | -.12735 | .03401 |
|                          | Equal variances not assumed |   |      | -1,606                       | 2,164 | .240            | -.04667         | .02906                                    | -.16304 | .06971 |

### Lampiran 3. Hasil Analisis Kadar Air Olahan Cokelat Setelah Penyimpanan

| Sampel Cokelat | Triplo          | Wadah kosong (gram) | Sampel (gram) | Wadah + sampel sebelum pemanasan (gram) | Wadah + sampel setelah pemanasan (gram) | Kadar Air (%) |       |
|----------------|-----------------|---------------------|---------------|---|---|---------------|-------|
| Aluminium Foil | 1               | 36,9486             | 1,0192        | 37,9678                                 | 37,9440                                 | 2,34          |       |
|                | 2               | 35,3682             | 1,0042        | 36,3724                                 | 36,3483                                 | 2,40          |       |
|                | 3               | 60,0771             | 1,0129        | 61,0900                                 | 61,0661                                 | 2,36          |       |
|                | Rerata          |                     |               |   |   |               | 2,37  |
|                | Standar Deviasi |                     |               |   |   |               | 0,025 |
| Metalize Film  | 1               | 50,0635             | 1,0285        | 51,092                                  | 51,0583                                 | 3,28          |       |
|                | 2               | 54,0515             | 1,0198        | 55,0713                                 | 55,0378                                 | 3,28          |       |
|                | 3               | 57,909              | 1,0102        | 58,9192                                 | 58,8852                                 | 3,37          |       |
|                | Rerata          |                     |               |   |   |               | 3,31  |
|                | Standar Deviasi |                     |               |   |   |               | 0,042 |

#### Rumus Perhitungan Kadar Air

$$\text{Kadar Air (\%)} = \frac{(M1 - M2)}{M1} \times 100$$

Keterangan:

Berat Awal Sampel (M1) = Berat Wadah + Sampel Sebelum Pemanasan – Berat Wadah Kosong

Berat Akhir Sampel (M2) = Berat Wadah + Sampel Setelah Pemanasan – Berat Wadah Kosong

Contoh Perhitungan:

$$M1 = 37,9678 - 36,9486 = 1,0192 \text{ gram}$$

$$M2 = 37,9440 - 36,9486 = 0,9954 \text{ gram}$$

$$\text{Kadar air (\%)} = \left( \frac{1,0192 - 0,9954}{1,0192} \right) \times 100$$

$$= \left( \frac{0,0238}{1,0192} \right) \times 100$$

$$= 0,02339 \times 100$$

$$= 2,339\%$$

#### Hasil Analisis Data Uji T Kadar Air pada Cokelat Hitam

| Independent Samples Test |                             |   |      |         |                              |                 |                 |   |          |         |
|--------------------------|-----------------------------|---|------|---------|------------------------------|-----------------|-----------------|---|----------|---------|
|                          |                             | Levene's Test for Equality of Variances |      |         | t-Test for Equality of Means |                 |                 | 95% Confidence Interval of the Difference |          |         |
|                          |                             | F                                       | Sig. | t       | df                           | Sig. (2-tailed) | Mean Difference | Std. Error Difference                     | Lower    | Upper   |
| Kadar air                | Equal variances assumed     | 1.925                                   | .238 | -27.106 | 4                            | <.001           | -.94333         | .03480                                    | -1.03996 | -.84671 |
|                          | Equal variances not assumed |   |      | -27.106 | 3.235                        | <.001           | -.94333         | .03480                                    | -1.04967 | -.83700 |

#### Lampiran 4. Hasil Analisis Sensori Olahan Cokelat Setelah Penyimpanan

##### 1. Sensori Warna Cokelat Hitam

##### 1a. Hasil Organoleptik Warna Cokelat Hitam

| Panelis                | Sampel       |             |             |              |             |             |
|------------------------|--------------|-------------|-------------|--------------|-------------|-------------|
|                        | F1           |             |             | F2           |             |             |
|                        | 628          | 399         | 213         | 137          | 567         | 362         |
| Panelis 1              | 5            | 5           | 4           | 5            | 5           | 4           |
| Panelis 2              | 5            | 5           | 4           | 5            | 4           | 5           |
| Panelis 3              | 5            | 5           | 5           | 5            | 5           | 5           |
| Panelis 4              | 5            | 4           | 3           | 4            | 5           | 4           |
| Panelis 5              | 5            | 4           | 4           | 3            | 4           | 5           |
| Panelis 6              | 5            | 4           | 4           | 4            | 4           | 5           |
| Panelis 7              | 5            | 4           | 5           | 5            | 5           | 4           |
| Panelis 8              | 4            | 4           | 4           | 4            | 4           | 4           |
| Panelis 9              | 3            | 4           | 4           | 4            | 5           | 5           |
| Panelis 10             | 4            | 5           | 5           | 5            | 4           | 4           |
| Panelis 11             | 5            | 4           | 4           | 3            | 3           | 5           |
| Panelis 12             | 3            | 3           | 4           | 5            | 2           | 4           |
| Panelis 13             | 4            | 3           | 3           | 3            | 3           | 4           |
| Panelis 14             | 4            | 3           | 2           | 4            | 3           | 4           |
| Panelis 15             | 4            | 3           | 4           | 3            | 3           | 4           |
| <b>Jumlah</b>          | <b>66</b>    | <b>60</b>   | <b>59</b>   | <b>62</b>    | <b>59</b>   | <b>66</b>   |
| <b>Rata-rata</b>       | <b>4,40</b>  | <b>4,00</b> | <b>3,93</b> | <b>4,13</b>  | <b>3,93</b> | <b>4,40</b> |
| <b>Rerata</b>          | <b>4,11</b>  |             |             | <b>4,16</b>  |             |             |
| <b>Standar Deviasi</b> | <b>0,206</b> |             |             | <b>0,191</b> |             |             |



**1b. Hasil Pengukuran Warna Cokelat Hitam Metode Minolta Chromameter**

| <b>Sampel</b>         | <b>Parameter</b> | <b>U1</b> | <b>U2</b> | <b>U3</b> | <b>Rerata</b> |
|-----------------------|------------------|-----------|-----------|-----------|---------------|
| <b>Aluminium Foil</b> | <b>L*</b>        | 43,27     | 44,21     | 43,99     | 43,82         |
|                       | <b>a*</b>        | 4,11      | 4,07      | 4,16      | 4,11          |
|                       | <b>b*</b>        | 6,70      | 7,49      | 7,30      | 7,16          |
| <b>Metalize Film</b>  | <b>L*</b>        | 43,14     | 43,48     | 44,56     | 43,73         |
|                       | <b>a*</b>        | 3,46      | 3,66      | 3,93      | 3,68          |
|                       | <b>b*</b>        | 6,26      | 6,89      | 7,66      | 6,94          |

## 2. Sensori Organoleptik Rasa Cokelat Hitam

| Panelis                | Sampel       |             |             |              |             |             |
|------------------------|--------------|-------------|-------------|--------------|-------------|-------------|
|                        | F1           |             |             | F2           |             |             |
|                        | 628          | 399         | 213         | 137          | 567         | 362         |
| Panelis 1              | 5            | 4           | 4           | 5            | 5           | 5           |
| Panelis 2              | 5            | 4           | 4           | 4            | 4           | 5           |
| Panelis 3              | 4            | 3           | 5           | 5            | 5           | 5           |
| Panelis 4              | 5            | 5           | 4           | 2            | 3           | 4           |
| Panelis 5              | 5            | 3           | 2           | 4            | 4           | 3           |
| Panelis 6              | 5            | 5           | 5           | 5            | 5           | 5           |
| Panelis 7              | 5            | 5           | 5           | 5            | 5           | 5           |
| Panelis 8              | 4            | 4           | 4           | 4            | 5           | 5           |
| Panelis 9              | 4            | 5           | 5           | 4            | 4           | 5           |
| Panelis 10             | 2            | 5           | 3           | 4            | 4           | 5           |
| Panelis 11             | 5            | 5           | 4           | 4            | 3           | 4           |
| Panelis 12             | 5            | 3           | 2           | 4            | 2           | 2           |
| Panelis 13             | 4            | 4           | 2           | 3            | 4           | 4           |
| Panelis 14             | 4            | 5           | 4           | 3            | 5           | 5           |
| Panelis 15             | 4            | 4           | 3           | 5            | 3           | 4           |
| <b>Jumlah</b>          | <b>66</b>    | <b>64</b>   | <b>56</b>   | <b>61</b>    | <b>61</b>   | <b>66</b>   |
| <b>Rata-rata</b>       | <b>4,40</b>  | <b>4,27</b> | <b>3,73</b> | <b>4,07</b>  | <b>4,07</b> | <b>4,40</b> |
| <b>Rerata</b>          | <b>4,13</b>  |             |             | <b>4,18</b>  |             |             |
| <b>Standar Deviasi</b> | <b>0,290</b> |             |             | <b>0,156</b> |             |             |

### 3. Sensori Organoleptik Aroma Cokelat Hitam

| Panelis                | Sampel       |             |             |              |             |             |
|------------------------|--------------|-------------|-------------|--------------|-------------|-------------|
|                        | F1           |             |             | F2           |             |             |
|                        | 628          | 399         | 213         | 137          | 567         | 362         |
| Panelis 1              | 5            | 4           | 3           | 5            | 4           | 5           |
| Panelis 2              | 4            | 3           | 5           | 4            | 5           | 5           |
| Panelis 3              | 5            | 2           | 4           | 4            | 5           | 5           |
| Panelis 4              | 5            | 5           | 5           | 3            | 4           | 4           |
| Panelis 5              | 4            | 4           | 5           | 5            | 4           | 4           |
| Panelis 6              | 5            | 4           | 5           | 5            | 5           | 4           |
| Panelis 7              | 5            | 5           | 5           | 4            | 4           | 5           |
| Panelis 8              | 4            | 4           | 5           | 4            | 5           | 4           |
| Panelis 9              | 5            | 3           | 4           | 5            | 5           | 5           |
| Panelis 10             | 4            | 4           | 5           | 5            | 2           | 3           |
| Panelis 11             | 4            | 4           | 4           | 5            | 3           | 3           |
| Panelis 12             | 4            | 4           | 3           | 3            | 2           | 3           |
| Panelis 13             | 4            | 3           | 4           | 3            | 3           | 4           |
| Panelis 14             | 4            | 4           | 4           | 2            | 4           | 4           |
| Panelis 15             | 4            | 3           | 3           | 5            | 4           | 5           |
| <b>Jumlah</b>          | <b>66</b>    | <b>56</b>   | <b>64</b>   | <b>62</b>    | <b>59</b>   | <b>63</b>   |
| <b>Rata-rata</b>       | <b>4,40</b>  | <b>3,73</b> | <b>4,27</b> | <b>4,13</b>  | <b>3,93</b> | <b>4,20</b> |
| <b>Rerata</b>          | <b>4,13</b>  |             |             | <b>4,09</b>  |             |             |
| <b>Standar Deviasi</b> | <b>0,290</b> |             |             | <b>0,114</b> |             |             |

#### 4. Sensori Organoleptik Tekstur Cokelat Hitam

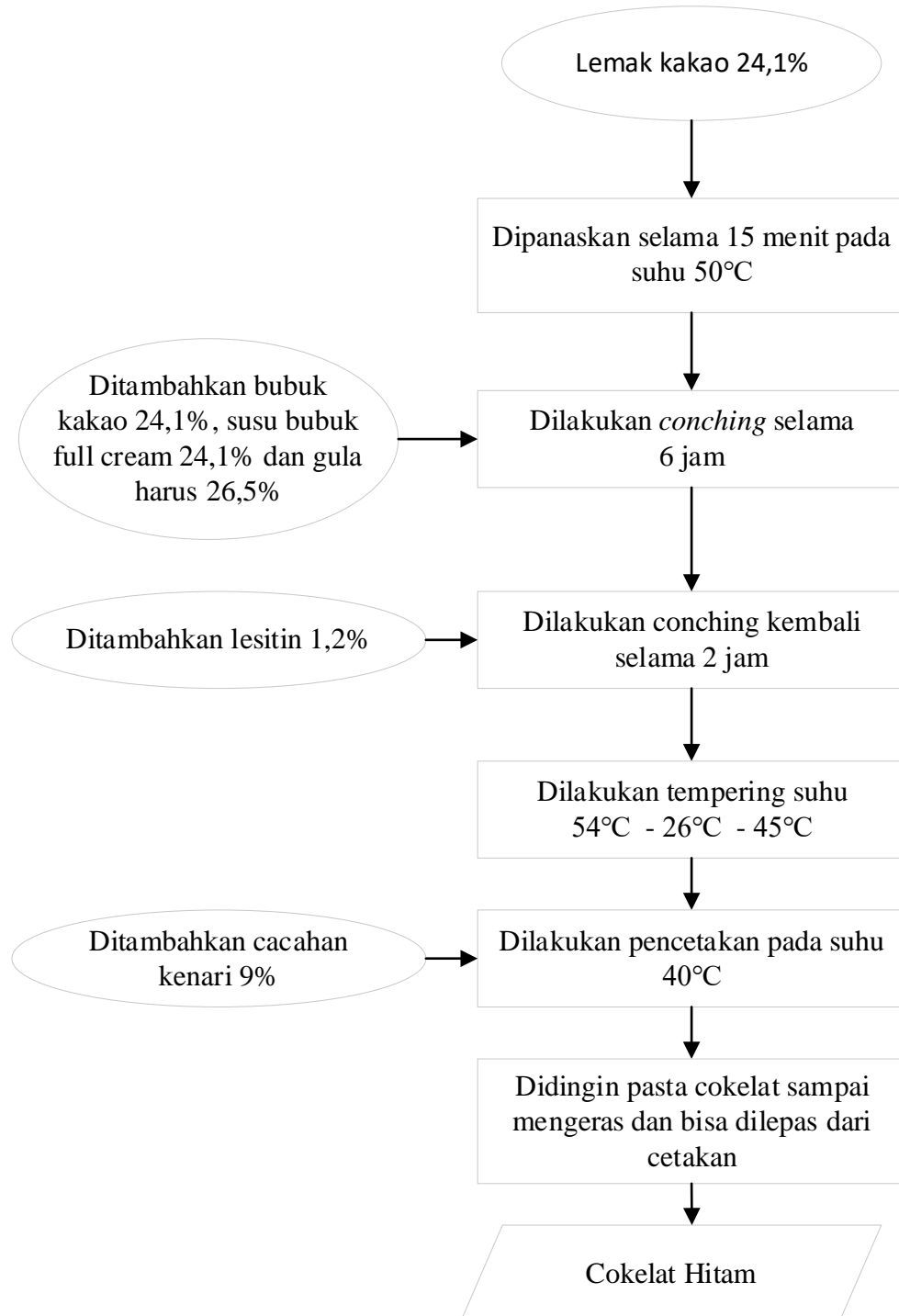
| Panelis                | Sampel       |             |             |             |             |             |
|------------------------|--------------|-------------|-------------|-------------|-------------|-------------|
|                        | F1           |             |             | F2          |             |             |
|                        | 628          | 399         | 213         | 137         | 567         | 362         |
| Panelis 1              | 4            | 4           | 4           | 3           | 3           | 3           |
| Panelis 2              | 4            | 4           | 5           | 3           | 3           | 3           |
| Panelis 3              | 3            | 3           | 4           | 4           | 4           | 3           |
| Panelis 4              | 4            | 5           | 4           | 4           | 5           | 3           |
| Panelis 5              | 4            | 4           | 3           | 4           | 3           | 2           |
| Panelis 6              | 5            | 4           | 4           | 4           | 4           | 5           |
| Panelis 7              | 5            | 5           | 5           | 4           | 5           | 4           |
| Panelis 8              | 4            | 5           | 4           | 4           | 4           | 4           |
| Panelis 9              | 4            | 4           | 3           | 5           | 5           | 4           |
| Panelis 10             | 4            | 5           | 4           | 2           | 4           | 5           |
| Panelis 11             | 3            | 5           | 5           | 3           | 4           | 3           |
| Panelis 12             | 4            | 5           | 4           | 5           | 2           | 3           |
| Panelis 13             | 4            | 4           | 4           | 4           | 4           | 4           |
| Panelis 14             | 3            | 3           | 5           | 3           | 5           | 4           |
| Panelis 15             | 3            | 3           | 3           | 4           | 3           | 3           |
| <b>Jumlah</b>          | <b>58</b>    | <b>63</b>   | <b>61</b>   | <b>56</b>   | <b>58</b>   | <b>53</b>   |
| <b>Rata-rata</b>       | <b>3,87</b>  | <b>4,20</b> | <b>4,07</b> | <b>3,73</b> | <b>3,87</b> | <b>3,53</b> |
| <b>Rerata</b>          | <b>4,04</b>  |             |             | <b>3,71</b> |             |             |
| <b>Standar Deviasi</b> | <b>0,136</b> |             |             | 0,140       |             |             |

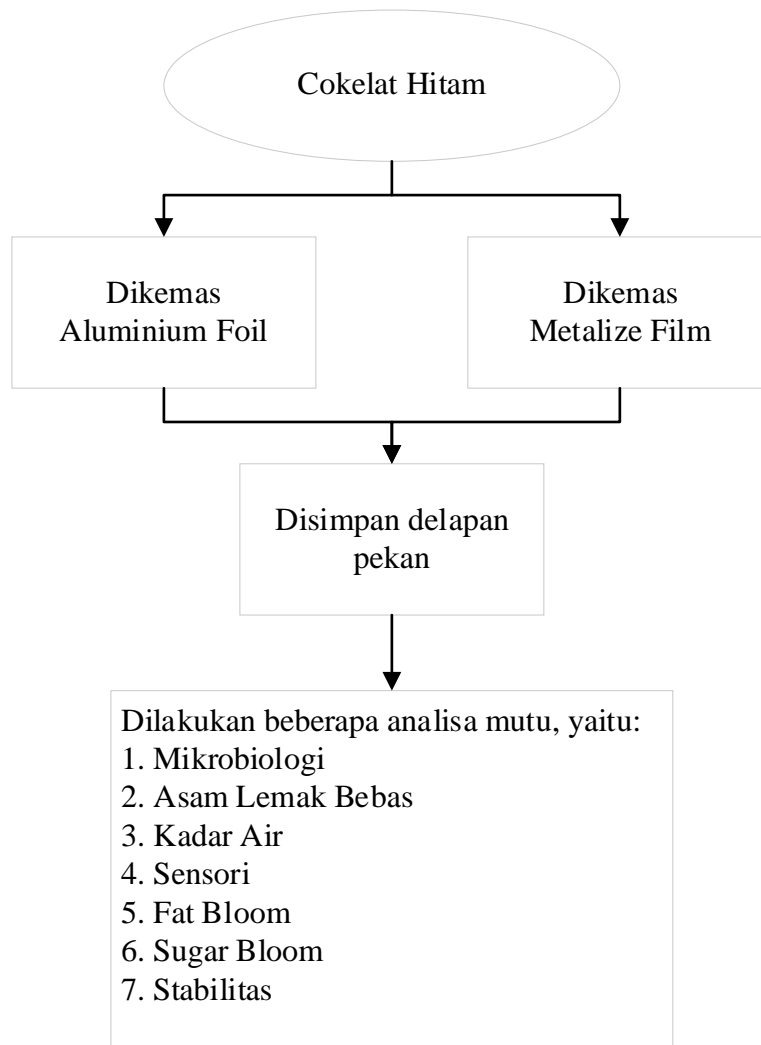
## Hasil Analisis Data Uji T Organoleptik pada Cokelat Hitam

|         |                             | Levene's Test for Equality of Variances |      |       |        |                 | t-Test for Equality of Means |                       |   |       |  |
|---------|-----------------------------|---|------|-------|--------|-----------------|------------------------------|-----------------------|---|-------|--|
|         |                             | F                                       | Sig. | t     | df     | Sig. (2-tailed) | Mean Difference              | Std. Error Difference | 95% Confidence Interval of the Difference |       |  |
|         |                             |   |      |       |        |                 |                              |                       | Lower                                     | Upper |  |
| Wama    | Equal variances assumed     | .202                                    | .654 | -.268 | 88     | .789            | -.044                        | .166                  | -.374                                     | .285  |  |
|         | Equal variances not assumed |   |      | -.268 | 87.936 | .789            | -.044                        | .166                  | -.374                                     | .285  |  |
| Rasa    | Equal variances assumed     | .000                                    | .993 | -.227 | 88     | .821            | -.044                        | .196                  | -.433                                     | .344  |  |
|         | Equal variances not assumed |   |      | -.227 | 87.895 | .821            | -.044                        | .196                  | -.433                                     | .344  |  |
| Tekstur | Equal variances assumed     | 3.810                                   | .054 | 2.034 | 88     | .045            | .333                         | .164                  | .008                                      | .659  |  |
|         | Equal variances not assumed |   |      | 2.034 | 85.368 | .045            | .333                         | .164                  | .008                                      | .659  |  |
| Aroma   | Equal variances assumed     | 1.891                                   | .173 | .249  | 88     | .804            | .044                         | .178                  | -.310                                     | .398  |  |
|         | Equal variances not assumed |   |      | .249  | 84.680 | .804            | .044                         | .178                  | -.310                                     | .399  |  |

## Lampiran 5. Diagram Alir

## Diagram Alir Pembuatan Cokelat



**Diagram Alir Desain Penelitian**

## Lampiran 6. Dokumentasi Penelitian

| Gambar  | Keterangan                                       |
|---|--|
|    | Pembuatan olahan cokelat                         |
|    | Pengujian stabilitas menggunakan microwave       |
|   | Pengujian kadar air menggunakan oven             |
|  | Pengujian sensori warna menggunakan colorimeter  |
|  | Pengujian asam lemak bebas dengan metode titrasi |





Pengujian sensori produk olahan cokelat dengan beberapa panelis