BAB 5
KESIMPULAN DAN SARAN

5.1 Kesimpulan

1. Kondisi optimum sintesis senyawa 2,5-dibenzilidensiklopentanon dalam katalis asam dengan bantuan iradiasi gelombang mikro pada daya 480 Watt selama 10 menit dengan persentase rendemen sebesar (34,6±3,9)%.
2. Kondisi optimum sintesis senyawa 2,5-bis-(4-hidroksi-3-metoksibenziliden) siklopentanon dalam katalis asam dengan bantuan iradiasi gelombang mikro pada daya 480 Watt selama 16 menit dengan persentase rendemen sebesar (43,5±4,3)%.
3. Senyawa 2,5-bis-(4-hidroksi-3-metoksibenziliden)siklopentanon menghasilkan rendemen yang lebih kecil dikarenakan dalam suasana asam terjadi polimerisasi antar molekul vanilin.

5.2 Saran

Perlu dilakukan uji aktivitas untuk mengetahui khasiat senyawa yang telah disintesis.

DAFTAR PUSTAKA

Akash, Muhammad. S.H., and Rehman, Kanwal. 2020, *Essentials of Pharmaceutical Analysis*, Springer, Singapore.

Aggarwal, B.B., Bhatt, I.D., Ichikawa, H., Ahn, K.S., Sethi, G., Sandur, S.K., Natarajan, C., Seeram, N., Shishodia, S. 2006, *Turmeric: The Genus Curcuma*, Taylor and Francis: New York.

Ameta, S.C., Punjabi, P.B., Ameta, R., and Ameta, C. 2015, Microwave-Assisted Organic Synthesis: A Green Chemical Approach, 1st ed, *Apple Academic Press Inc*, Canada

Artanti, L. 2021, 'Gugus Metoksi pada 4-metoksibenzaldehid terhadap Sintesis 2,5-bis-(4-metoksibenziliden)siklopentanon', *Skripsi*, Sarjana Farmasi, Universitas Katolik Widya Mandala Surabaya.

Barmawie, N.M., Rahardjo, D., Wahyuno dan Ma'mun. 2006, Status Teknologi Budidaya dan Pasca Panen Tanaman Kunyit dan Temulawak Sebagai Penghasil Kurkumin, *Perkembangan Teknologi Tanaman Rempah dan Obat,* **18(2)**: 84 – 99

Bruice, P.Y. 2003, *Organic Chemistry*, 4th Edition, Prentice Hall, New York.

Budimarwanti, C. 2009, 'Penyediaan Senyawa Berkhasiat Obat Secara Sintesis dengan Analisis Retrosintesis', *Prosiding Seminar Nasional Penelitian, Pendidikan, dan Penerapan MIPA*, UNY, Yogyakarta, pp. 158-165.

Budimarwanti, C., dan Handayani, S. 2010, 'Efektivitas Katalis Asam Basa Pada Sintesis 2-hidroksikalkon, Senyawa yang Berpotensi Sebagai Zat Warna', *Prosiding Seminar Nasional Kimia dan Pendidikan Kimia*, Yogyakarta.

Calvino, V., Picallo, M., López-Peinado, A. J. Martín-Aranda, R. M. dan Durán-Valle, C. J. 2006, Ultrasound Accelerated Claisen-Schmidt Condensation: A Green Route to Chalcones, *Applied Surface Science*, **252(17)**: 6071-6074.

Carey, F., A. 2000, *Organic Chemistry*, 4th Edition, Mc-Graw Hill Higher Education, New York.

Chattopadhyay, I., Biswas, K., Bandyopadhyay, U., and Banerjee1, R. K. 2004, Turmeric and Curcumin: Biological Actions and Medicinal Applications, *Current Science*, **87(1)**: 44-53

Clayden, J. Greeves, N., and Warren, S., 2012, *Organic Chemistry Second Edition*, Oxford University Press, New York

Da'i, M. 2003, 'Uji Aktivitas Antiproliferatif Pentagamavunon-0 terhadap Sel Raji, Sel HeLa dan Sel Myeloma', *Tesis*, Program Pascasarjana, Universitas Gadjah Mada, Jogjakarta.

Da'i, M., Hanwar, D., dan Utami, W. 2006, Sintesis PGV-0 dengan Katalis Asam dan Pengembangan Analisis Kemurnian dengan HPLC (*High Performance Liquid Chromatography*), *Jurnal Penelitian Sains dan Teknologi,* **7(1):** 33-41

Deinstrop, E.H. 2007. *Applied Thin-Layer Chromatography*, Eckental: Wiley-VCH.

Departemen Kesehatan RI. 2014, *Farmakope Indonesia Edisi V*, Jakarta: Kementrian Kesehatan RI.

Eryanti, Y., Nurulita, Y., Hendra, R., Yuharmen, Y., Syahri, J., and Zamri, A. 2011, Synthesizing Derivatives from Cyclopentanone Analogue Curcumin and Their Toxic, Antioxidant, and Antiinflammatory Activities, *Makara Journal of Science*, **15(2)**: 117- 123.

Gandjar, I.G. dan Rohman, A. 2015, *Kimia Farmasi Analisis*, Pustaka Pelajar, Yogyakarta.

Handayani, S., Budimarwanti, C., dan Haryadi, W. 2017, Microwave-Assisted Organic Reactions: Eco-friendly Synthesis of Dibenzylidenecyclohexanone Derivatives Via Crossed Aldol Condensation, *Indonesian Journal of Chemistry*, **17(2)**: 336-341.

Handler N., Jaeger W., Puschacher H., Leisser K., Erker T. 2007, Synthesis of Novel Curcumin Analogues and Their Evaluation as Selective Cyclooxygenase (COX-1) Inhibitors, *Journal Chemistry and Pharmaceutical Bulletin*, **55(1):**64-71.

Horikoshi S., Arai, Y., Ahmad I., DeCamillis C., Hicks K., Schauer B., and Serpone N. 2020, Application of Variable Frequency Microwaves in Microwave-Assisted Chemistry: Relevance and Suppression of Arc Discharges on Conductive Catalysts, *Catalysts***, 10(7)**: 1-14.

Jenie, U.A., Kardono, L.B.S., Hanafi, M., Rumampuk, R.J., dan Darmawan A. 2014, *Teknik Modern Spektroskopi NMR: Teori dan Aplikasi*

dalam Elusidasi Struktur Molekul Organik, Edisi pertama, Jakarta: LIPI Press.

Istyastono, E.P., S.M.P Rr. Sri Untari Siwi, Utama, A.A., dan A.M. Supardjan. 2004, Sintesis Senyawa Baru Berpotensi Anti-Inflamasi: Garam Natrium dari Pentagamavunon-0, *Indonesian Journal of Chemistry*, **4(3)**: 180–185.

Kappe, C.O., and Stadler, A. 2005, *Microwaves in Organic and Medicinal Chemistry*, WILEY-VCH Verlag GmbH & Co. KgaA, Weinheim, pp. 9- 10.

Kar, S., Rai, P., Chelli, S. M., Akhir, A., Shivalingegowda, N., Chopra, S., Krishnappagowda, L. N., Belliraj, S. K. dan Golakoti, N. R. 2021, Exploring the Unexpected Formation of Spirobibenzopyrans and Benzopyrylium Salts and Effect of Lewis Acids on The Claisen Schmidt Reaction, *Journal of Molecular Structure*, **1240:** 130598.

Kim H.Y., Park, E.J. and Jou, I. 2003, Curcumin Supress Janus Kinase STAT Inflammatory Signaling Through Activation of SCC Homology 2 Domain Containing Tyrosine Phosphatase 2 in Brain Microglia, *Journal Immunology*, **171:** 6072-6079.

Kuhnert, N. 2002, Microwave-Assisted Reactions in Organic Synthesis-Are There any Nonthermal Microwave Effects?, *Angewandte Chemie International Edition*, **41(11)**: 1863–1866.

Kumar, R., Sharma, P. K. and Mishra, P. S. 2012, A Review on The Vanillin Derivatives Showing Various Biological Activities, *International Journal of PharmTech Research*, **4(1)**: 266-279.

Lehman, J.W. 2004, *Microscale Operation Organic Chemistry*, Prentice Hall Upper Sanddle River, pp., 493, 634.

Mahrwald, R. (ed), 2004, *Modern Aldol Reactio*n, WILEY-VCH Verlag GmbH & Co. KgaA, Weinheim.

McMurry, J. 2016. *Organic Chemistry*, 9th Edition, Belmont: Thomson Learning, Inc.

O'Neil, M., Heckelman, P., Koch, C., Roman, K., and Kenny, C., (Eds). 2006, *The Merck Index*, 14th Ed, Merck & Co., Inc., New Jersey.

Pavia, D. L., Lampman, G.M., Kriz, G. S., and Vyvyan, J.R. 2009, *Introduction to Spectroscopy*, Fourth Edition, Brooks/Cole, Belmont.

Pirrung, M., 2017, *Handbook of Synthetic Organic Chemistry*, Elsevier, London.

Pudjono., Sismindari., dan Widada, H. 2008, Sintesis 2,5-bis-(4'-hidroksi-benzilidin)siklopentanon dan 2,5-bis-(4'-klorobenzilidin)siklopentanon serta Uji Antiproliferatifnya terhadap Sel HeLa, *Majalah Farmasi Indonesia*, **19(1)**: 48 – 55.

Pudjono dan Supardjan. 2004, Sintesis Hasil Kondensasi Turunan Benzaldehida dan Siklopentanon dengan Katalis Basa, QUE Project of the Pharmacy Education Program Fakultas Farmasi UGM

Pudjono, Supardjan, dan Irawati T. 2006, Sintesis 2,5-dibenzilidinsiklopentanon dari Benzaldehid dan Siklopentanon dengan Variasi Pelarut, *Majalah Farmasi Indonesia*, **17(1)**:45-49.

Rahman, A.F.M.M., Ali, R., Jahng, Y., and Kadi, A. A. A. 2012, Facile Solvent Free Claisen-Schmidt Reaction: Synthesis of α,α′-bis-(Substitutedbenzylidene)-cycloalkanones and α,α′-bis-(Substitutedalkylidene)-cycloalkanones, *Journal Molecule*, **17(1)**: 571- 583.

Rayar, A., Veitia, M.S. and Ferroud, C. 2015, An Efficient and Selective Microwave-Assisted Claisen-Schmidt Reaction for The Synthesis of Functionalized Benzalacetones, *Springerplus*, **4:** 221.

Ritmaleni, 2016, Synthesis of Pentagamavunon-0 (PGV-0): An Improved Technique, *International Journal of Pharmaceutical Sciences Review and Research*, **39(1):** 9-11

Robinson, T.P., Ehlers, T., Hubbard Iv, R.B., Bai, X., Arbiser, J.L., Goldsmith, D.J. and Bowen, J.P. 2003, Design, Synthesis, and Biological Evaluation of Angiogenesis Inhibitors: Aromatic Enone and Dienone Analogues of Curcumin, *Bioorganic and Medicinal Chemistry Letters*, **13(1)**: 115-117.

Rouessac, F., and Rouessac, A. 2007, *Chemical Analysis: Modern Instrumentation Methods and Techniques*, 2nd Ed. London: John Wiley & Sons, Ltd.

Santo R.D., Costi R., Artico M., Tramontano, E., La Colla P., and Pani, A. 2003, HIV-1 Integrase Inhibitors that Block HIV-1 Replication in Infected Cells: Planning Synthetic Derivatives from Natural Products, *Journal Pure Applied Chemistry*, **75:**195–206.

Simbara, A., Sardjiman, dan Nurkhasanah. 2005, 'Sintesa Senyawa 2,5-Bis(4-Hidroksi-3-Metoksibenzilidin)Siklopentanon dengan Variasi Jenis Pelarut', *Prosiding Seminar Nasional Penelitian*, Pendidikan dan Penerapan MIPA, UNY, Yogyakarta, pp. 67-77.

Sardjiman. 2000, 'Synthesis of Some New Series of Curcumin Analogues, Antioxydative, Antiinflammatory, Antibacterial Activities and Quantitative-Structure Activity Relationship', *Tesis*, Gadjah Mada University, Yogyakarta.

Sholikhah, A.H., dan Prabawati, S. Y. 2020, Sintesis Senyawa Analog Kurkumin 2,5-bis-(4-hidroksi-3-metoksibenzilidin)siklopentanon dengan Teknik Grinding Sebagai Bahan Tabir Surya, *Indonesian Journal of Halal Science*, **1(2)**: 36-44.

Smith, J.G. 2011, *Organic Chemistry*, 3rd Edition, McGraw-Hill, New York.

Solomons, T.W.G., Fryhle, C.B., Snyder, S.A. 2013, *Organic Chemistry*, 11th Edition, John Willey & Sons, New Jersey

Stankovic, I. 2004, *Curcumin. Chemical and Technical Assessment* (CTA), FAO, p.1-8.

Stephen, Bresnick. 2004, *Kimia Organik*, Jakarta: Hipokrates.

Suhartati, Tati. 2017, *Dasar-Dasar Spektrofotometri UV-Vis dan Spektrometri Massa untuk Penentuan Struktur Senyawa Organik*, Bandar Lampung: Aura.

Suzuki, M., Nakamura, T., Iyoki, S., Fujiwara, A., Watanabe, Y., Mohri, K., Isobe, K., Ono, K. and Yano, S. 2005, Elucidation of Anti-Allergic Activities of Curcumin-related Compounds with a Special Reference to Their Antioxidative Activities, *Journal Biological and Pharmaceutical Bulletin*, **28:** 1438 – 1443.

Theresih, K., & Budimarwanti, C. 2016, Pengaruh Gugus p-Metoksi Pada Reaksi Kondensasi Claysen-Schmidt Menggunakan Metoda Grinding, *Jurnal Sains Dasar*, **5(2)**: 124-132.

Wang, Z. 2010, *Comprehensive Organic Name Reaction and Reagents*, John Wiley & Sons, Hoboken.

X. Wei, Z.Y. Du, X. Zheng, X.X. Cui, A.H. Conney, K. Zhang., 2012, Synthesis and Evaluation of Curcumin-related Compounds for Anticancer Activity, *European Journal of Medicinal Chemistry*, **53:** 235-245

Yunsari S., Rusdianasari., Husaini A. 2019, CPO Based Biodiesel Production Using Microwaves Assisted Method, *Journal of Physics: Conference Series*, **1167(1)**: 012036.

Zhang Y. 2016, The Application of Microwave Technology in Chemistry and Chemical Engineering, *Advances in Economics, Business and Management Research*, **30:** 50–53.

Z.Y. Du, R.R. Liu, W.Y. Shao, X.P. Mao, L. Ma, L.Q. Gu, Z.S. Huang, A.S. Chan, 2006, α-Glucosidase Inhibition of Natural Curcuminoids and Curcumin Analogs, *European Journal of Medicinal Chemistry*, **41:** 213-218.