# DAFTAR PUSTAKA


Abe, K., Hori, Y., and Myoda, T. 2019. Volatile Compounds of Fresh and Processed Garlic (Review). *Experimental and Therapeutic Medicine*. 19: 1585 – 1593.

Abbas, H.M.K., Kong, X., Wu, J., Ali, M., and Dong, W. 2019. Antimicrobial Potential of Genes from Garlic (*Allium sativum* L.). *Medicinal Plants*. 1 - 13.

Avato, P., Tursi, F., Vitali, C., Miccolis V., and Candido, V. 2000. Allylsulfide Constituents of Garlic Volatile Oil as Antimicrobial Agents. *Phytomedicine*. 7. (3): 239 - 243.

Bae, S.E., Cho, S.Y., Won, Y.D., Lee, S.H. and Park, H.J. 2014. Changes in S-allyl cysteine contents and physicochemical properties of black garlic during heat treatment. *LWT-Food Science and Technology*. 55. (1): 397 - 402.

Balachandran, S., Kentish, S.E., Mawson, R., and Ashokkumar, M. 2006. Ultrasonic enhancement of the supercritical extraction from ginger. *Ultrasonics sonochemistry*. 13. (6): 471 - 479.

Balouiri, M., Sadiki, M., and Ibnsouda, S.K. 2016. Methods for In Vitro Evaluating Antimicrobial Activity:A Review. *Journal of Pharmaceutical Analysis*. 6: 71 - 79.

Bennet, J.E., Dolin, R., and Blaser, M.J. (Editors). 2020. *Mandell, Douglas, and Bennett's: Principles and Practice of Infectious Diseases*. Philadelphia: Elsevier, Inc. p. 236 - 264.

Bharat, P., Dave A.R., Chandola H.M., Goyal M.R., Shukla V.J., and Khant D.B. 2014. Comparative Analytical Study of Single Bulb and Multi Bulb Garlic (*Allium sativum* Linn.) *International Journal of Ayurveda & Alternative Medicine*. 2. (4): 86 - 91.

Bhardwaj, M. Singh, B.R., Sinha, D.K., Kumar, V., Prasanna, V.O.R., Varan, S.S., Nirupama, K.R., Pruthvishree, and Archana, S.B.S. 2016. Potential of Herbal Drug and Antibiotic Combination Therapy: A New Approach to Treat Multidrug Resistant Bacteria. *Pharmaceutica Analytica Acta*. 7. (11): 1 - 14.

Bollenbach, T. 2015. Antimicrobial Interaction: Mechanisms and implications for Drug Discovery and Resistance Evalution. *Current Opinion in Microbiology*. 27: 1 - 9.

Botas, J., Fernandes, A., Barros, L., Alves, M.J., Carvalho, A.M., and Ferreira, I.C.F.R. 2019. A Comparative Study of Black and White Allium sativum L.: Nutritional Composition and Bioactive Properties. *Molecules.* 24. (2194): 1 - 11.

Brunton, L.L., Chabner, B.A., and Knollmann, B.C. (Editors). 2011. *Goodman & Gilman's: The Pharmacological Basis of Therapeutics*. 12th ed. United States: McGraw-Hill Education. p. 1487 - 1489. *Available as PDF file.*

Brunton, L.L., Dandan, R.H., and Knollmann, B.C. 2018. *Goodman & Gilman's: The Pharmacological Basis of Therapeutics. 13th ed*. United States: McGraw-Hill Education. p. 1023 - 1029.

Capuano, E. and Fogliano, V. 2011. Acrylamide and 5-hydroxymethylfurfural (HMF): A review on metabolism, toxicity, occurrence in food and mitigation strategies. *LWT-food science and technology*, 44. (4): 793 - 810.

Chung, S.Y., Han, K.H., Bae, S.H., Han, S.H. and Lee, Y.K. 2020. Effects of the Fermented Black Garlic Extract on Lipid Metabolism and Hepatoprotection in Mice. *The Korean Journal of Food And Nutrition*. 33. (1): 17 - 26.

CLSI. 2016. *Performance Standards fo Antimicrobial Susceptibility Testing. 26th Ed. CLSI Supplement M100S*. Wayne, PA: Clinical and Laboratory Standards Institute.

Darbyshire, B. and Henry, R.J. 1981. Differences in fructan content and synthesis in some *Allium* species. *New Phytologist*. 87.(2): 249 - 256.

Depkes RI. 1986. *Sediaan Galenika*. Jakarta: Departemen Kesehatan RI. p. 4 - 6.

Difco and BBL Team. 1998. *Manual of Microbiological Culture Media 11th Edition*. New York: Becton Dickinson and Company.

Direktorat Jenderal Pengawasan Obat dan Makanan. 2000. *Parameter Standard Umum Ekstrak Tumbuhan Obat*. Jakarta: Departemen Kesehatan RI. p. 5.

Djide, M.S. dan Sartini. 2016. *Dasar-Dasar Mikrobiologi Farmasi.* Makassar: Lephas. p. 371.

Eun, B.S., Yong, C.Y., Duk, W.Y., Ha, L.S., and Jin, P.H. 2014. Changes in S-Allyl Cysteine Contents and Physicochemical Properties of Black Garlic During Heat Treatment. *J. Food Science and Technology.* (55): 397 - 402.

Elosta, A., Slevin, M., Rahman, K., and Ahmed, N. 2017. Aged Garlic has More Potent Antiglycation and Antioxidant Properties Compared to Fresh Garlic Extract In Vitro. *Scientific Reports*. 7. (39613): 1 - 9.

Garlic and Health Group. 2007. Collection of Six Papers. *Medical and Aromatic Plant Science and Biotechnology*. 1: 1 - 36.

Ghane, M. and Azimi, Z. 2014. Isolation, Identification and Antimicrobial Susceptibility of *Pseudomonas* spp. Isolated from Hospital Environment in Tonekabon, North of Iran. *Journal of Applied & Environmental Microbiology*. 2. (4): 97 - 101.

Harborne, J.B. 1987. *Metode Fitokimia: Penuntun Cara Modern Menganalisis Tumbuhan Terbitan Kedua*. Bandung: Penerbit ITB. p. 6 - 8.

Harvey, R.A. dan Champe, P.C. 2013. *Farmakologi Ulasan Bergambar Edisi 4.* Jakarta: EGC. p. 428 - 432.

Hernawan, U.E. dan Setyawan, A.D. 2003. Review: Senyawa Organosulfur Bawang Putih (*Allium sativum* L.) dan Aktivitas Biologinya. *Biofarmasi*. 1. (2): 65 - 76.

Hossain, M.M., Lee, S.I., and Kim, I.H. 2014. Effect of Dietary Korean Aged Garlic Extract by *Leukonostoc citreum* SK2556 on Production, Hematological Status, Meat Quality, Relative Organ Weight, Targeted *Escherichia coli* Colony and Excreta Gas Emission in Broilers. *Animal Feed Science and Technology.* 198: 335 - 338.

Hyun-Joo, J., Hyun-Jin, L., Dong-Kyu, Y., Da-Som, J., Ji-Han, K., and Chi-Ho, L. 2018. Antioxidant and Antimicrobial Activities of Fresh Garlic and Aged Garlic by-Products Extracted with Different Solvents. *Food Sci Biotechnol.* 27. (1): 219 - 225.

Il-Sook, C., Han-Sam, C., and Young-Soon, L. 2014. Physicochemical and Antioxidant Properties of Black Garlic. *Molecules*. 19: 16811 – 16823.

Ji-Hyeon, R. and Dawon, K. 2017. Physicochemical Properties, Biological Activity, Health Benefits, and General Limitations of Aged Black Garlic: A Review. *J. Molecules*. 22. (919): 1 - 13.

Kang, O.J. 2016. Physicochemical characteristics of black garlic after different thermal processing steps. *Preventive nutrition and food science*. 21. (4): 348 - 354.

Katzung, B.G. and Trevor, A.J. 2015. *Basic and Clinical Pharmacology 13th Edition*. United States: McGraw-Hill Education. p. 771 - 772.

Kim, J.H., Nam, S.H., Rico, C.W., and Kang, M.Y. 2012. A comparative study on the antioxidative and anti-allergic activities of fresh and aged black garlic extracts. *International journal of food science and technology*. 47. (6): 1176 - 1182.

Kim, N.Y., Park, M.H., Jang, E.Y. and Lee, J. 2011. Volatile distribution in garlic (*Allium sativum* L.) by solid phase microextraction (SPME) with different processing conditions. *Food Science and Biotechnology*. 20. (3): 775 - 782.

Lorian, V. 2005. *Antimicrobial Combinations, in Antibiotics In Laboratory Medicine 5th Edition*. Philadelphia: Lippincott Williams and Wilkins. p. 365 - 441.

Lupo, A., Marisa, H., and Jean, Y.M. 2018. Antimicrobial Resistance in *Acinetobacter* spp. and *Pseudomonas* spp. *Microbiol Spectrum.* 6. (3): 1 - 16.

Lu, X., Rasco, B.A., Jabal, J.M.F., D., Aston, D.E., Lin, M., and Konkel, M.E. 2011. Investigating Antibacterial Effects of Garlic (*Allium sativum*) Concentrate and Garlic-Derived Organosulfur Compounds on *Campylobacter jejuni* by Using Fourier Transform Infrared Spectroscopy, Raman Spectroscopy, and Electron Microscopy. *Applied and Environmental Microbiology*. 77. (15): 5257 - 5269.

Lu, X., Li, N., Qiao, X., Qiu, Z. and Liu, P. 2018. Effects of thermal treatment on polysaccharide degradation during black garlic processing. *LWT-Food Science and Technology*. 95: 223 - 229.

Mandal, S.C., Mandal, V., and Das, A.K. 2015. *Essentials of Botanical Extraction Principles and Applications*. USA: Elsevier Inc. p. 96 - 101.

Magiorakos, A.P., Srinivasan, A., Carey, R.B., Canneli, Y., Falagas, M.E., Giske, C.G., Monnet, D.L. 2012. Multidrug-Resistant, Extensively Drug-Resistant and Pandrug-Resistant Bacteria: An International Expert Proposal for Interim Standard Definitions for Acquired Resistance. *Clin Microbiol Infect.* 18. (3): 268 - 281.

Marjoni, M.R. 2016. *Dasar-Dasar Fitokimia*. Jakarta: TIM.

Martínez-Casas, L., Lage-Yusty, M. and López-Hernández, J. 2017. Changes in the aromatic profile, sugars, and bioactive compounds when purple garlic is transformed into black garlic. *Journal of agricultural and food chemistry*. 65. (49): 10804 - 10811.

Miladulhaq, M. 2018. *Perubahan Sifat Fisikokimia Selama Pengolahan Bawang Putih Tunggal menjadi Bawang Hitam Menggunakan Rice Cooker*. Institut Pertanian Bogor: Fakultas Teknologi Pertanian. 1 - 10.

Molina-Calle, M., Priego-Capote, F. and de Castro, M.D.L. 2017. Headspace−GC–MS volatile profile of black garlic vs fresh garlic: evolution along fermentation and behavior under heating. *LWT-Food Science and Technology*. 80: 98 - 105.

Moulia, M.N., Syarief, R., Iriani, E.S., Kusumaningrum, H.D., dan Suyatma, N.E. 2018. Antimikroba Ekstrak Bawang Putih: Review. *Pangan*. 27. (1): 55 - 66.

Moussa, S.H., Tayel, A.A., Al-Hasan, A.A., and Farouk, A. 2013. Tetrazolium/Formazan Test as An Efficient Method to Determine Fungal Chitosan Antimicrobial Activity. *Journal of Mycology*. 1 - 8.

Moussaoui, F. and Alaoui, T. 2016. Evaluation of Antibacterial Activity and Synergistic Effect Between Antibiotic and The Essential Oils of Some Medicinal Plants. *Asian Pac. J. Trop. Biomed.* 6. (1): 32 - 37.

Mun-Su, K., Min-Ju, K., Woo-Suk, B., Keun-Sung, K., and Sung-Soo, P. 2012. Determination of S-Allyl-L-cystein, Diallyl Disulfide, and Total Amino Acids of Black Garlic after Spontaneous Short-term Fermentation*. J Korean Soc Food Sci Nutr.* 41. (5): 661 - 665.

Nakamoto, M., Kunimura, K., Suzuki, J-I., Kodera, Y. 2019. Antimicrobial Properties of Hydrophobic Compounds in Garlic: Allicin, Vinyldithiin, Ajoene and Diallyl Polysulfides (Review). *Experimental and Therapeutic Medicine*. 19: 1550 - 1553.

Nelly, M.T., Teresa, A.T., Hugo, E.A, Angeles, S.C., and Neith, P. 2017. Ultrasound Assisted Extraction for the Recovery of Phenolic Compounds from Vegetable Sources. *Agronomy*. 7. (47): 1 - 19.

Nguyen N., Mac, G., and Nguyen, T. 2017. Biological Activities of Black Garlic Fermented with *Lactobacillus plantarum* PN05 and Some Kinds of Black Garlic Presenting Inside Vietnam. *Indian Journal of Pharmaceutical Education and Research*. 51. (4): 672 - 678.

O'Gara, E.A., Hill, D.J., and Maslin, D.J. 2000. Activities of Garlic Oil, Garlic Powder, and Their Diallyl Constituents. *A Applied and Environmental Microbiology*. 66. (5): 2269 - 2273.

Park, C. 2018. *Medicinal Properties of Garlic and Its Derivatives*. Texas: Baylor University. p. 1 - 50.

Penna, V.T.C., Martins, S.A.M., and Mazola, P.G. 2002. Identification of Bacteria in Drinking and Purified Water During The Monitoring of A Typical Water Purification System. *BMC Public Health*. 2. (13): 1471 - 2458.

Pooi-Yin, C., Parasakthi, N., and Lip-Yong, C. 2011. Synergistic Antimicrobial Activity Between Pentacyclic Triterpenoids and Antibiotics against *Staphylococcus aureus* strains. *Annals of Clinical Microbiology and Antimicrobials.* 10. (25): 1 - 6.

Qiu, Z., Zheng, Z., Zhang, B., Sun-Waterhouse, D. and Qiao, X. 2020. Formation, nutritional value, and enhancement of characteristic components in black garlic: A review for maximizing the goodness to humans. *Comprehensive Reviews in Food Science and Food Safety*. 19. (2): 801 - 834.

Ramirez, D.A., Locatelli, D.A., Gonzalez, Roxana E., Cavagnaro, P.F., and Camargo, A.B. 2016. Analytical Methods for Bioactive Sulfur Compounds in *Allium*: An Integrated Review and Future Directions. *Journal of Food Composition and Analysus*. 61: 4 - 19.

Riedel, S., Morse, S.A., Mietzner, T., and Miller, S. 2019. *Jawetz, Melnick, & Adelberg's: Medical Microbiology 28th Edition*. United States: McGraw-Hill Education. p. 253 - 256.

Rose, P., Whiteman, M., Moore, P.K., and Zhu, Y.Z. 2005. Bioactive S-alk(en)yl Cysteine Sulfoxide Metabolites in The Genus *Allium*: The Chemistry of Potential Therapeutic Agents. *Nat. Prod. Rep*. 22: 351 - 368.

Rukmana, R. 1995. *Budidaya Bawang Putih*. Jakarta: Kanisius. p. 10 - 26.

Saifudin, A., Rahayu, dan Teruna. 2011. *Standarisasi Bahan Obat Alam*. Yogyakarta: Graha Ilmu.

Sandrakirana, R., Fauzia, L., Alami, E.N., aisyawaty, L., Rahmawati, D., Handayati, W., Susanti, I., dan Baswarsiati. 2018. *Panduan Budidaya Bawang Putih*. Jawa Timur: Kementrian Pertanian, BPTP.

Santos, H.M., Lodeiro, C., and Martinez, J.L.C. 2009. The Power of Ultrasound. WILEY-VCH Verlag GmbH & Co.KGaA: *Ultrasound in Chemistry: Analytical Applications.* p. 1 - 16.

Sasaki, J.I., Lu, C., Machiya, E., Tanahashi, M., and Hamada, K. 2007. Processed Black Garlic (*Allium sativum*) Extracts Enhance Anti-Tumor Potency Against Mouse Tumors. *Medical and Aromatic Plant Science Biotechnology*. 1. (2): 279 - 280.

Satish, K.P., Moellering, R.C., Eliopoulos, G.M. 2005. Antimicrobial Combinations, In: Lorian V, Editor. Antibiotics in Laboratory Medicine. 5th ed. Philadelphia: Lippincott Williams & Wilkins. p. 290-365.

Sholihah, M.A., Ahmad, U., and Budiastra, I.W. 2017. Aplikasi Gelombang Ultrasonik untuk Meningkatkan Rendemen Ekstraksi dan

Efektivitas Antioksi dan Kulit Manggis. *Jurnal Keteknikan Pertanian*. 5. (2): 161 - 168.

Siswandono. 2016. *Kimia Medisinal Jilid 2 Edisi Kedua*. Surabaya: Airlangga University Press. p.123 - 138.

Soedarto. 2015. *Mikrobiologi Kedokteran*. Jakarta: CV. Sagung Seto. 335 - 336.

Stefanović, O.D. 2018. Synergistic Activity of Antibiotics and Bioactive Plant Extracts: A Study Against Gram-Positive and Gram Negative Bacteria. *Bacterial Pathogenesis and Antibacterial Control*. 23 - 48.

Tabaraki, R. and Nateghi, A. 2011. Optimization of Ultrasonic-Assisted Extraction of Natural Antioxidants from Rice Bran Using Response Surface Methodology. *Ultrasonics Sonochemistry*. 18: 1279 - 1286.

Thompson, L.H. and Doraiswamy, L.K. 1999. Sonochemistry: Science and Engineering. *Industrial and Engineering Chemistry Research*. 38: 1215 - 1249.

Tjitrosoepomo, G. 2013. *Taksonomi Tumbuhan (Spermatophyta)*. Yogyakarta: Gadjah Mada University Press. p. 413 - 415.

Tummler, B. 2019. Emerging Therapies against Infections with *Pseudomonas aeruginosa*. *F1000Research 2019*. 8. (1371): 1 - 14.

Ullah, W., Muhammad, Q., Hazir, R., Fazli, B., Saadullah, K., Zia, U.R, Zahid, K., Tamara, D., and Noor, M. 2016. Multi Drug Resistant *Pseudomonas aeruginosa*: Pathogen Burden and Associated Antibiogram in a Tertiary Care Hospital of Pakistan. *Microbial Pathogenesis*. 97: 209 - 212.

Velliyagounder, K., Ganeshnarayan, K., Velusamy, S.K., and Fine, D.H. 2012. In Vitro Efficacy of Diallyl Sulfides against the Periodontopathogen *Aggregatibacter actinomycetemcomitans*. *J. Antimicrobial Agents and Chemotherapy*: 2397 - 2407.

Vilkhu, K., Mawson, R., Simons, L., and Bates, D. 2019. Applications and Opportunities for Ultrasound Assisted Extraction in The Food Industry - A Review. *Innovative Food Science & Emerging Technologies*. 765: 1 - 9.

Vinatoru, M. 2001. An Overview of The Ultrasonically Assisted Extraction of Bioactive Principles from Herbs. *Ultrasonics Sonochemistry*. 8: 303 - 313.

Wang, H.Y., Qian, H. and Yao, W.R. 2011. Melanoidins produced by the Maillard reaction: Structure and biological activity. *Food chemistry*. 128. (3): 573 - 584.

Wang, Y., Zhang, J.L., and Jing, H. 2016. Composition Analysis of Black Garlics Prepared by Different Garlic Types of and Processing Technologies. *Journal of Food Safety and Quality.* 7. (9): 3085 - 3091.

Wardiyati, S. 2004. Pemanfaatan Ultrasonik dalam Bidang Kimia. *Puslitbang Iptek Bahan*. 419 - 424.

Wen-Hu, L., Cheng-Chin, H., and Mei-Chin, Y. 2008. *In Vitro* Anti-*Helicobacter pylori* Activity of Diallyl Sulphides and Protocatechuic Acid. *Phytother. Res.* 22: 53 - 57.

Wibowo, J.T. 2015. Resistensi Bakteri Patogen dan Strategi Mengatasi Bakteri Resisten. *Oseana*. 40. (3): 11 - 17.

Yuan, H., Sun, L., Chen, M. and Wang, J., 2018. An analysis of the changes on intermediate products during the thermal processing of black garlic. *Food chemistry*. 239: 56 - 61.

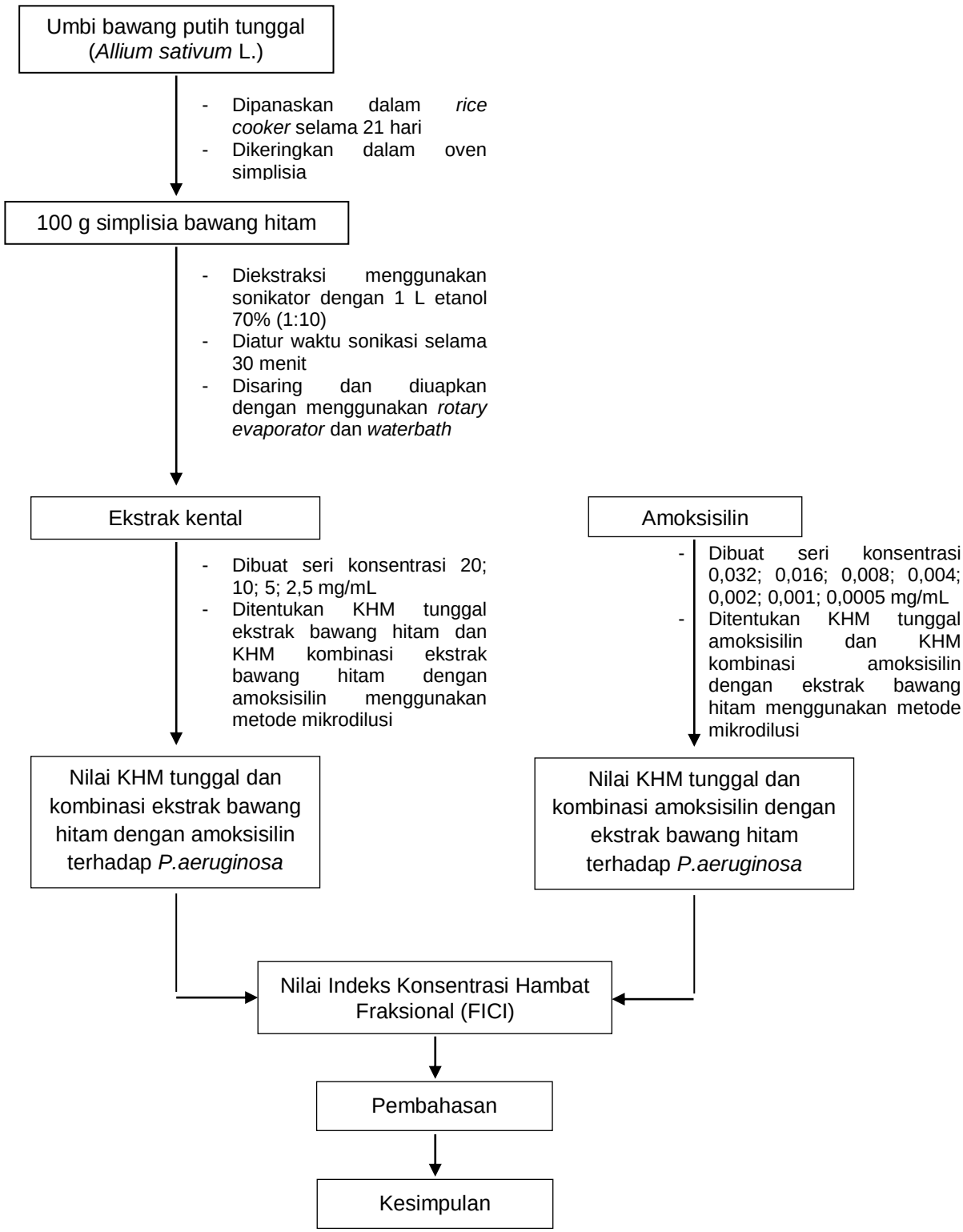
Zhang, Z., Lei, M., Liu, R., Gao, Y., Xu, M. and Zhang, M. 2015. Evaluation of alliin, saccharide contents and antioxidant activities of black garlic during thermal processing. *Journal of Food Biochemistry*. 39. (1): 39 - 47.

Zhang, X., Li, N., Lu, X., Liu, P. and Qiao, X., 2016. Effects of temperature on the quality of black garlic. *Journal of the Science of Food and Agriculture*. 96. (7): 2366 - 2372.

Zhi-Qing, H., Wei-Hua, Z., Yoshiyuki, Y., Nozomi, A., Yukihiko, H., and Tadakatsu, S. 2002. Additive, Indifferent and Antagonistic Effects in Combinations of Epigallocatechin Gallate with 12 non-β-lactam Antibiotics against Methicillin-Resistant *Staphylococcus aureus. Journal of Antimicrobial Chemotherapy.* 50: 1051 - 1054.

# Lampiran 1

## Skema kerja umum



**Lampiran 2**

**Skema penyiapan sampel dan ekstrak bawang hitam**

Umbi bawang putih tunggal (*Allium sativum* L.)

- Dimasukkan ±1kg dalam *rice cooker*
- Diatur pada mode *warm* (± 65$^{o}$C)
- Didiamkan selama 21 hari hingga diperoleh bawang hitam
- Disortasi
- Dikeringkan dalam oven simplisia pada suhu 40$^{o}$C selama 6 hari

Simplisia bawang hitam

- Ditimbang 50 g bawang hitam menggunakan timbangan analitik
- Ditambahkan 500 mL etanol 70%
- Disonikasi selama 30 menit menggunakan sonikator
- Disonikasi 50 g bawang hitam lainnya dengan 500 mL etanol 70% selama 30 menit
- Disaring dengan bantuan *vacuum pump*
- Diuapkan dengan bantuan alat *rotary evaporator* (suhu 40$^{o}$C & kecepatan 70 rpm) dan *waterbath*

Ekstrak kental

**Lampiran 3**

**Skema perhitungan pada ekstraksi bawang hitam**

Perbandingan simplisia dan cairan penyari = 1:10 (b/v)

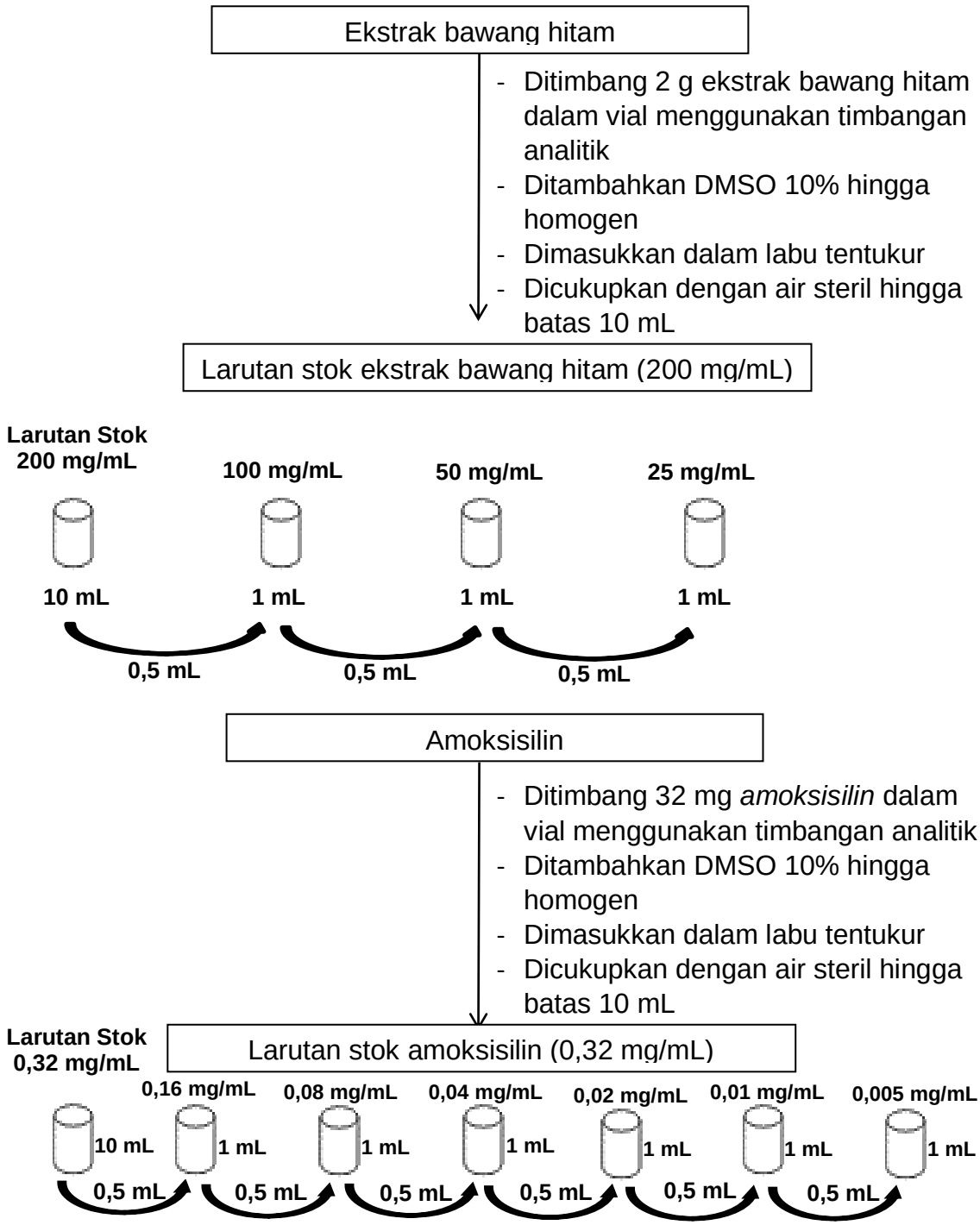
$$\frac{simplisia}{cairan\ penyari} = \frac{1\ g}{10\ mL} = \frac{50\ g}{500\ mL}$$

Total simplisia bawang hitam = 50 g + 50 g = 100 g

Total cairan penyari etanol 70% = 500 mL + 500 mL = 1000 mL

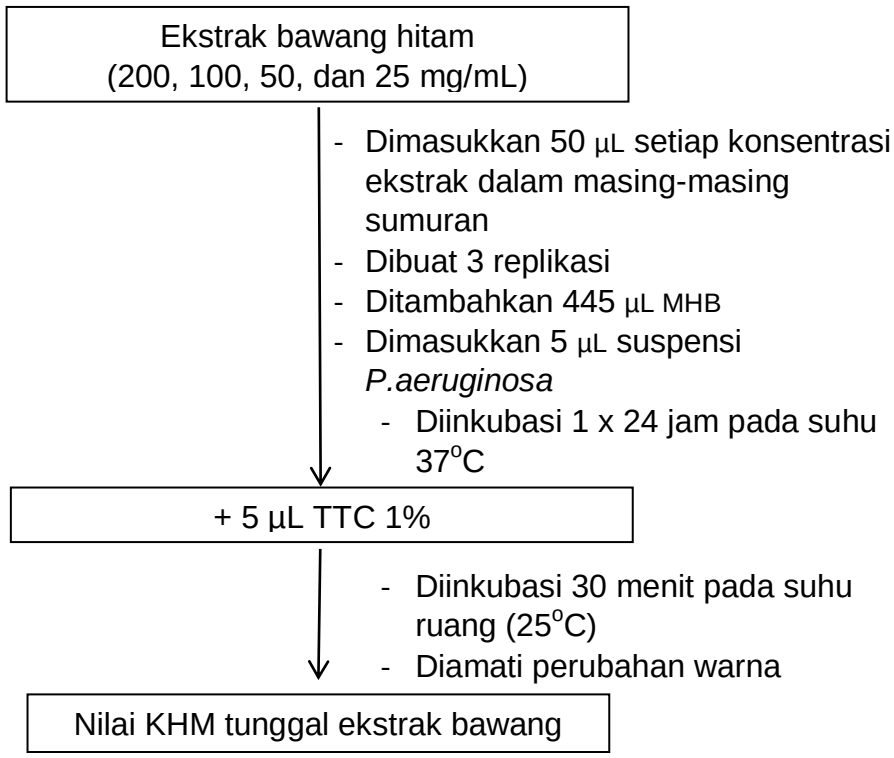
**Lampiran 4**

**Skema pengenceran ekstrak bawang hitam dan amoksisilin**



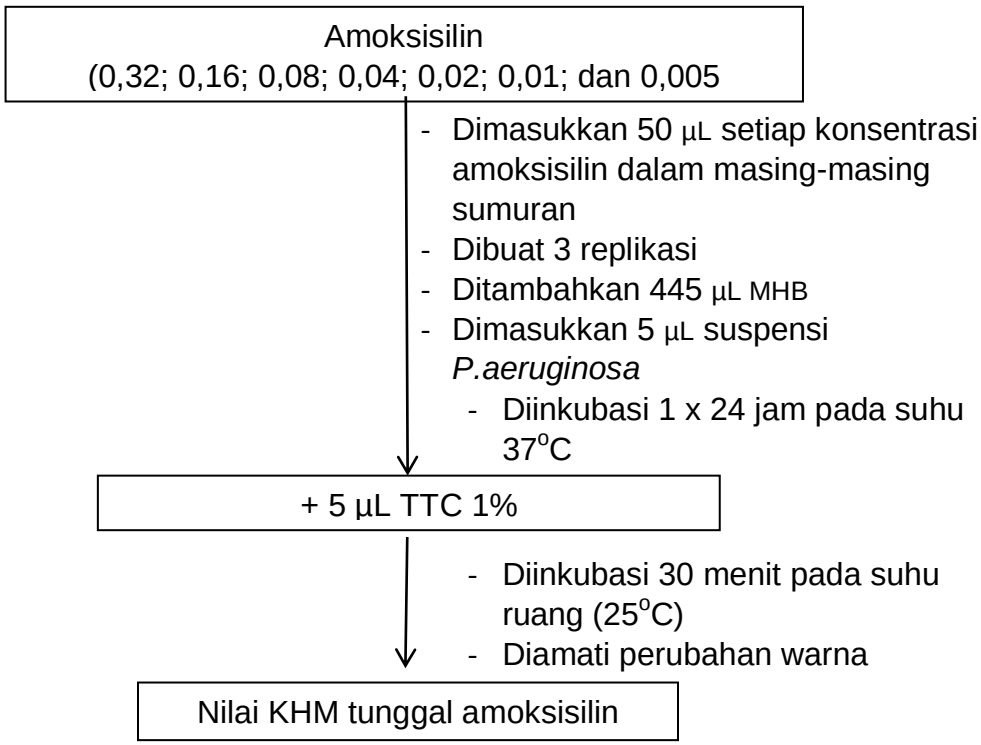
**Lampiran 5**

**Skema penentuan KHM tunggal ekstrak bawang hitam**



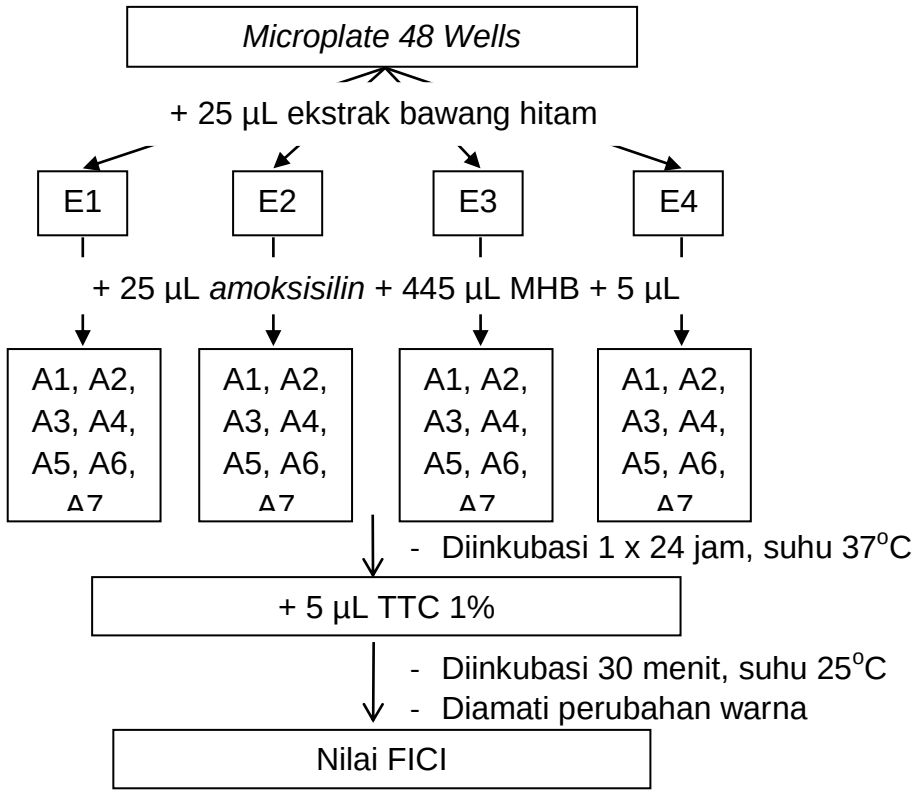
**Lampiran 6**

**Skema penentuan KHM tunggal amoksisilin**



**Lampiran 7**

**Skema penentuan KHM dan FICI kombinasi ekstrak bawang hitam dengan amoksisilin**




*Keterangan:*

| | |
|---|---|
| E1 | = Ekstrak Bawang Hitam 20 mg/mL |
| E2 | = Ekstrak Bawang Hitam 10 mg/mL |
| E3 | = Ekstrak Bawang Hitam 5 mg/mL |
| E4 | = Ekstrak Bawang Hitam 2,5 mg/mL |
| A1 | = Amoksisilin 0,032 mg/mL |
| A2 | = Amoksisilin 0,016 mg/mL |
| A3 | = Amoksisilin 0,008 mg/mL |
| A4 | = Amoksisilin 0,004 mg/mL |
| A5 | = Amoksisilin 0,002 mg/mL |
| A6 | = Amoksisilin 0,001 mg/mL |
| A7 | = Amoksisilin 0,0005 mg/mL |

## Lampiran 8

## Komposisi medium

1. ***Mueller-Hinton Agar***

| | |
|---|---|
| *Beef extract* | 2 gram |
| *Acid hydrolysate of casein* | 17,5 gram |
| *Starch* | 1,5 gram |
| *Agar* | 17 gram |
| *Aquadest* | 1 Liter |

2. ***Mueller-Hinton Broth***

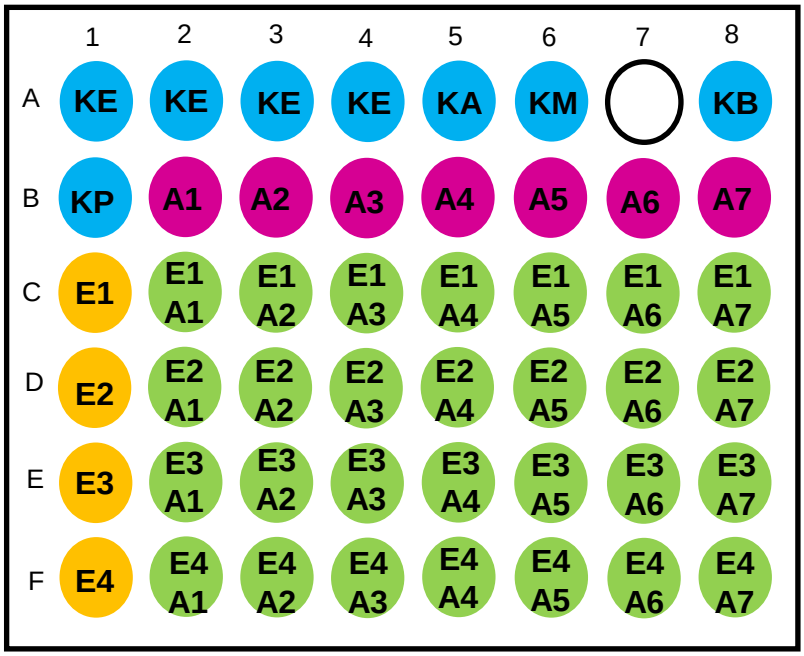
| | |
|---|---|
| *Acid casein pepton* | 17,5 gram |
| *Beef infusion* | 2 gram |
| *Corn starch* | 1,5 gram |
| *Aquadest* | 1 Liter |

3. ***McFarland No. 5***

| | |
|---|---|
| *Sulfuric acid* 1 % | 9,5 mL |
| *Barium chloride* 1% | 0,5 mL |

## Lampiran 9

**Denah pengisian pada penentuan nilai KHM tunggal dan kombinasi ekstrak bawang hitam dengan amoksisilin**



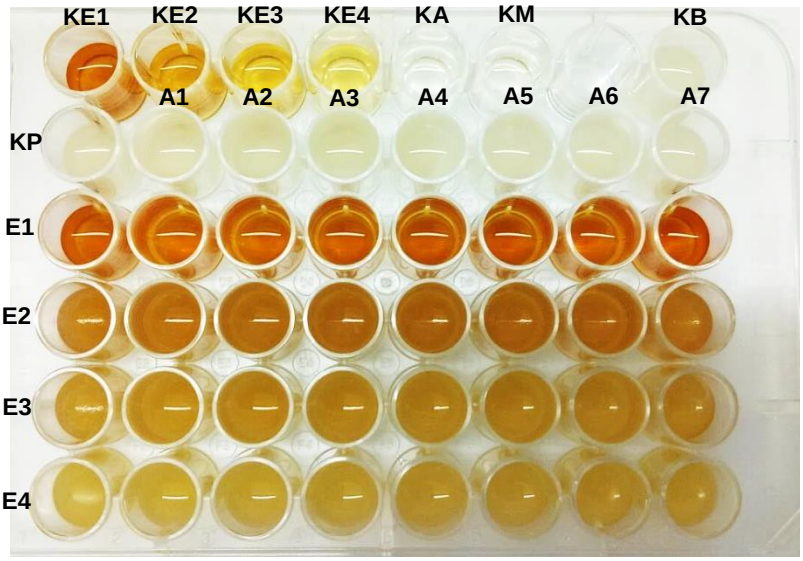

**Gambar 7. Denah pengisian pada setiap sumuran**

Keterangan:

A1 = Amoksisilin 0,032 mg/mL
A2 = Amoksisilin 0,016 mg/mL
A3 = Amoksisilin 0,008 mg/mL
A4 = Amoksisilin 0,004 mg/mL
A5 = Amoksisilin 0,002 mg/mL
A6 = Amoksisilin 0,001 mg/mL
A7 = Amoksisilin 0,0005mg/mL
E1 = Ekstrak Bawang Hitam 20 mg/mL
E2 = Ekstrak Bawang Hitam 10 mg/mL
E3 = Ekstrak Bawang Hitam 5 mg/mL
E4 = Ekstrak Bawang Hitam 2,5 mg/mL
KE1 = Kontrol Ekstrak Bawang Hitam 20 mg/mL
KE2 = Kontrol Ekstrak Bawang Hitam 10 mg/mL
KE3 = Kontrol Ekstrak Bawang Hitam 5 mg/mL
KE4 = Kontrol Ekstrak Bawang Hitam 2,5 mg/mL
KA = Kontrol Amoksisilin
KM = Kontrol Medium
KB = Kontrol Medium + Bakteri
KP = Kontrol Pelarut + Bakteri
● = Penentuan KHM Tunggal Amoksisilin
● = Penentuan KHM Ekstrak Bawang Hitam
● = Penentuan KHM Kombinasi Ekstrak Bawang Hitam dengan Amoksisilin
● = Penentuan Kontrol
○ = Tidak Berisi Bahan Uji

## Lampiran 10

## Hasil penentuan nilai KHM ekstrak bawang hitam dan amoksisilin dengan metode *microdilution checkerboard assay*




**Gambar 8. Hasil pengamatan sebelum penambahan TTC 1%**


**Gambar 9. Hasil pengamatan setelah penambahan TTC 1%**

Keterangan:

| | | | |
|---|---|---|---|
| A1 | = Amoksisilin 0,032 mg/mL | E1 | = Ekstrak Bawang Hitam 20 mg/mL |
| A2 | = Amoksisilin 0,016 mg/mL | E2 | = Ekstrak Bawang Hitam 10 mg/mL |
| A3 | = Amoksisilin 0,008 mg/mL | E3 | = Ekstrak Bawang Hitam 5 mg/mL |
| A4 | = Amoksisilin 0,004 mg/mL | E4 | = Ekstrak Bawang Hitam 2,5 mg/mL |
| A5 | = Amoksisilin 0,002 mg/mL | KE1 | = Kontrol Ekstrak Bawang Hitam 20 mg/mL |
| A6 | = Amoksisilin 0,001 mg/mL | KE2 | = Kontrol Ekstrak Bawang Hitam 10 mg/mL |
| A7 | = Amoksisilin 0,0005 mg/mL | KE3 | = Kontrol Ekstrak Bawang Hitam 5 mg/mL |
| KM | = Kontrol Medium | KE4 | = Kontrol Ekstrak Bawang Hitam 2,5 mg/mL |
| KB | = Kontrol Bakteri + Medium | KA | = Kontrol Amoksisilin |
| KP | = Kontrol Pelarut + Bakteri + Medium | | |

Bening (tidak ada perubahan warna) = Tidak ada pertumbuhan bakteri
Merah (ada perubahan warna) = Ada pertumbuhan bakteri

# Lampiran 11

## Hasil penentuan rata-rata KHM tunggal dan kombinasi ekstrak bawang hitam dengan amoksisilin

**Tabel 7. Rata-rata nilai KHM tunggal dan kombinasi ekstrak etanol bawang hitam dengan amoksisilin**

| | | | Amoksisilin | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | mg/mL | | 0,032 | 0,016 | 0,008 | 0,004 | 0,002 | 0,001 | 0,0005 |
| Ekstrak Bawang Hitam | | | - | - | - | - | - | - | - |
| | 20 | + | + | + | + | + | + | + | + |
| | 10 | - | - | - | - | - | - | - | - |
| | 5 | - | - | - | - | - | - | - | - |
| | 2,5 | - | - | - | - | - | - | - | - |
| Kontrol | KM | | + | | | | | | |
| | KB | | - | | | | | | |
| | KP | | - | | | | | | |
| | KE | | + | | | | | | |
| | KA | | + | | | | | | |

Keterangan:

+ = Tidak ada pertumbuhan bakteri (tidak berubah warna menjadi merah atau tidak keruh)

- = Ada pertumbuhan bakteri (berubah warna menjadi merah atau keruh

KM = Kontrol Medium

KB = Kontrol Bakteri + Medium

KP = Kontrol Pelarut + Bakteri + Medium

KE = Kontrol Ekstrak Bawang Hitam

KA = Kontrol Amoksisilin

= Tunggal Amoksisilin

= Tunggal Ekstrak Bawang Hitam

= Kombinasi

= Kontrol

## Lampiran 12

## Hasil perhitungan indeks konsentrasi hambat fraksional (FICI)

$FIC_{1(Ekstrak)} = \frac{\text{KHM ekstrak bawang hitam kombinasi amoksisilin}}{\text{KHM ekstrak bawang hitam}}$

$= \frac{20\ mg/ml}{20\ mg/ml}$

$= 1$

$FIC_{2(Amoksisilin)} = \frac{\text{KHM amoksisilin kombinasi ekstrak bawang hitam}}{\text{KHM amoksisilin}}$

$= \frac{>0{,}032\ mg/ml}{>0{,}032\ mg/ml}$

$= 1$

$FICI = FIC_{1(Ekstrak)} + FIC_{2(Amoksisilin)}$

$= 1 + 1$

$= 2$