

BAB 5

KESIMPULAN DAN SARAN

5.1. Kesimpulan

- 1) Ekstrak etanol umbi bawang putih tunggal (*Allium sativum* L.) memiliki aktivitas antibakteri terhadap *Propionibacterium acnes* dengan konsentrasi 20%, 30%, 40%, dan 50% berturut-turut adalah $6,16 \pm 0,05$ mm, $6,33 \pm 0,15$ mm, $7,2 \pm 0,23$ mm, dan $7,4 \pm 0,26$ mm.
- 2) Ekstrak etanol umbi bawang putih tunggal (*Allium sativum* L.) memiliki aktivitas penghambatan biofilm *Propionibacterium acnes* dengan penghambatan pembentukan biofilm 99,68% pada konsentrasi 12,5% hingga 72,83 % pada konsentrasi 0,39%.
- 3) Golongan senyawa pada ekstrak etanol umbi bawang putih tunggal (*Allium sativum* L.) yang diduga memiliki aktivitas antibakteri terhadap *Propionibacterium acnes* adalah flavonoid dan minyak atsiri.

5.2. Saran

- 1) Perlu dilakukan penelitian lebih lanjut mengenai pemisahan terhadap senyawa fenol ekstrak etanol umbi bawang putih tunggal (*Allium sativum* L.) untuk dilakukan penelitian lebih lanjut terhadap khasiat antibakterinya sehingga dapat dikembangkan menjadi bahan baku obat terhadap infeksi yang disebabkan oleh *Propionibacterium acnes*.
- 2) Perlu dilakukan penelitian lebih lanjut dengan konsentrasi yang sama untuk mengetahui struktur senyawa yang memiliki aktivitas antibiofilm.

DAFTAR PUSTAKA

- Achermann, Y., Goldstein, E.J.C., Coenye, T. and Shirtliff, M.E. 2014, *Propionibacterium acnes*: from Commensals to Opportunistic Biofilm-associated Implant Pathogen, *Clin Microbiol Rev*, **27(3)**:419–40.
- Afifa, C.O., Yulianti, A.B. dan Dharmmika, S. 2017, Efek Toksik Ekstrak Air Bawang Putih Tunggal (*Allium Sativum*) Dosis Tinggi Terhadap Cedera Hepatosit, *Prosiding Pendidikan Dokter*, **3(2)**:76-80, 2017.
- Agnesa, O.S., Susilo, H. dan Lestari, S.R. 2017, Aktivitas Immunostimulan Ekstrak Bawang Putih Tunggal pada Mencit yang Diinduksi *Escherichia col*, *Pharmaciana*, **7(1)**:105-112.
- Agoes, G. 2007, *Teknologi Bahan Alam*, Penerbit ITB, Bandung.
- Ahmed, B. 2007, *Chemistry Of Natural Products*, Departemen of Pharmaceutical Chemistry of Science, Jamia Hamdard, New Delhi.
- Albritton, R.L., Coen, D.M. and Golan, D.E. 2008, 'Principles of Combination Chemotherapy', in: Golan, D.E., Tashjian, A.H., Armstrong, E.J. and Armstrong, A.W., *Principles of Pharmacology: The Pathophysiologic Basis of Drug Therapy*, 2nd ed., Lippincott Williams and Wilkins, New York, United States of America.
- Albuquerque, R. G., Rocha, M. A., Bagatin, E., Tufik, S. and Andersen, M. L. 2014, Could Adult Female Acne Be Associated With Modern Life, *Arch. Dermatol. Res*, **306**: 683–688.
- Amagase, H. 2006, Clarifying the Real Bioactive Constituents of Garlic. *Journal of Nutrition*, **136**:716S-725S.
- Backer, C.A. and Brink, R.C.B.V.D. 1968, *Flora of Java (Spermatophytes only)*, Vol 3. Wolters-Noordhoof. V. Gorningen, Netherland : Hal. 132.
- Badan POM, 2011, Gunakan Antibiotik Secara Rasional untuk Mencegah Kekebalan Kuman, *Info POM*, **12 (2)**: 01-03.
- Bailey, L.H. 1950, *The Standard Cyclopedia of Horticulture*, **1**: 2.

- Berridge, M.V., Herst, P.M. and Tan, A.S. 2005, Tetrazolium dyes as tools in cell biology : new insights into their cellular reduction, *Biotechnology Annual review*, **11**: 127-52.
- Bjarnsholt, T, Thomsen, J.S and Kirketerp-Møller, K. 2011, Success Rate of Split-Thickness Skin Grafting of Chronic Venous Leg Ulcers Depends on the Presence of *Pseudomonas aeruginosa*: A Retrospective Study. Plos One.
- Bojar, R.A. and Holland, K.T. 2004, Acne and *Propionibacterium acnes*, *Clin, Dermatol*, **22**:375–379.
- Brooks, G.F., Butel, J.S. and Morse, S.A. 2001, *Jawetz, Melnick, & Adelberg's: Mikrobiologi kedokteran (Medical Microbiology)*, Diterjemahkan dari Bahasa Inggris oleh bagian mikrobiologi Fakultas Kedokteran Universitas Airlangga, Salemba medika, Jakarta.
- Burkhead, K.D., Schisler, D.A. and Slininger, P.T. 1995, Bioautography Shows Antibiotic Production by Soil Bacterial Isolates Antagonistic To Fungal Dry Rot Of Potatoes, *Soil Biology and Biochemistry*, **27(12)**: 1611-1616.
- Caporaso, N. and Smith, S.M Ing R.H.K. 1983, Antifungal Activity in Human Urine and Serum After Injection of Garlic. *Antimicrobial Agents Chemother*, **23**:700-2.
- Chambers, H.F. 2006, 'Beta-Laktam Antibiotics and Other Inhibitors of Cell Wall Synthesis', in: Katzung, B.G., *Basic and Clinical Pharmacology*, 10thed., McGraw Hills Companies, Inc., New York.
- Choma, I. 2005, *The Use of Thin-Layer Chromatography With Direct Bioautography for Antimicrobial Analysis*. LCGC Europe, **21**:77-8.
- Choma, I.M. and Grzelak, E.M. 2011, Review- Bioautography Detection in Thin-Layer Chromatography, *Journal of Chromatography A.*, **1218**: 2684–2691.
- Coenye, T., Honraet, K., Rossel, B. and Nelis, H.J. 2008, Biofilms in Skin Infections: *Propionibacterium acnes* and *Acne vulgaris*, **Infect Disord Drug Targets**; **8**:156–9.
- Costeron, J.W. and Stewart, P.S. 2001, Battling Biofilm, *Scientific American*; 61-67.

- Cowan, M.M., 1999, Plant Products as Antimicrobial Agents, *Clinical Microbiology Reviews*. **12**: 564 – 582.
- Darsana, I.G.O., 2012, Potensi Dajuun Binahong (*Anredera cordifolia* (Tenore) Steenis) dalam Menghambat Pertumbuhan Bakteri *Escherichia coli* secara In Vitro, *Indonesia Medicus Veterinus*, **1 (3)**: 337 – 351.
- Das, S. & Reynolds, R. V. 2014, Recent Advances In Acne Pathogenesis: Implications for Therapy, *Am. J. Clin. Dermatol*, **15**: 479–488.
- Degitz, K., Placzek, M., Borelli, C. and Plewig, G. 2007, Pathophysiology of acne, *J. Dtsch. Dermatol. Ges*, **5**: 316–323.
- Departemen Kesehatan Republik Indonesia. 1977, *Materia Medika Indonesia* Jilid I, Jakarta: Direktorat Pengawasan Obat dan Makanan.
- Departemen Kesehatan Republik Indonesia. 1989, *Materia Medika Indonesia* Jilid V, Jakarta: Direktorat Pengawasan Obat dan Makanan.
- Departemen kesehatan Republik Indonesia. 1995, *Farmakope Indonesia, edisi IV*, Jakarta: Departemen Kesehatan Republik Indonesia, **4**: 449-450.
- Departemen Kesehatan RI. 2008, *Profil kesehatan Indonesia 2007*. Jakarta : Depkes RI Jakarta.
- Departemen Kesehatan Republik Indonesia, 2014, *Farmakope Indonesia, edisi V*, Jakarta: Direktorat Jenderal Pengawasan Obat dan Makanan, hal 660.
- Direktorat Jenderal Pengawasan Obat dan Makanan Republik Indonesia (DirJen POM RI), 2000, *Parameter Standar Umum Ekstrak Tumbuhan Obat*, Jakarta: Departemen Kesehatan Republik Indonesia. P. 10, 11, 12.
- Donlan, R.M. and Costeron, J.W. 2002, Biofilm : Survival Mechanism of Clinical Relevant Microorganism. *Clin Microbial Rev*,**15**:167-193.
- Ebadi, D. 2007, *Pharmacodynamic Basis of Herbal Medicine*, Taylor & Francis Group, New York, hal. 499-506.

- Evans, D. M., Kirk, K. M., Nyholt, D. R., Novac, C. and Martin, N. G., 2005, Teenage Acne is Influenced by Genetic Factors, *Br. J. Dermatol*, **152**: 579–581.
- Foroutan-Rad, M., Tappeh, K.H. and Khademvatan, S. 2016, Antispasmodic and Immunomodulatory Activity of *Allium sativum* (Garlic), *Journal of Evidence-Based Complementary & Alternative Medicine*, **22 (1)**: 141-155.
- Gandjar, I. G. dan A. Rohman. 2010, *Kimia Farmasi Analisis*, Penerbit Pustaka Pelajar, Yogyakarta, 24-25, 366.
- Geddes, A.M., Bridgwater, F.A., Williams, D.N. dan Oon, J. 1970, Bacteriological Studies with Clindamycin, *Brit. M.J.*, **43**: 575-587.
- Gilbert, P., Das, J. and Foley, I. 1997, Biofilms Susceptibility to Antimicrobials. *Adv. Dent. Res*, **11**: 160–167.
- Gillespie, S. H., 2002, Evolution of Drug Resistance in *Mycobacterium tuberculosis*: clinical and Molecular Perspective, *Antimicrobial Agents and Chemotherapy*, **46**:267–274.
- Gilman, A.G., 2007, *Goodman & Gilman Dasar Farmakologi Terapi*, diterjemahkan oleh Tim Alih Bahasa Sekolah Farmasi ITB, Edisi X, 877, Penerbit Buku Kedokteran, EGC, Jakarta.
- Goldberg, D. J. and Berlin, A. L. 2011, Changing Age of *Acne vulgaris* Visits: Another Sign of Earlier Puberty, *Pediatr. Dermatol*, **28**: 645–648.
- Grice, E.A., Kong, H.H., Conlan, S., Deming, C.B., Davis, J., Young, A.C., Bouffard, G.G., Blakesley, R.W., Murray, P.R., Green, E.D., Turner, M.L. and Segre, J.A. 2009, Topographical and Temporal Diversity of The Human Skin Microbiome, *Science* **324**:1190–1192.
- Gunthard, H., Hany, A., Turina, M. and Wust. J. 1994, *Propionibacterium acnes* As a Cause of Aggressive Aortic Valve Endocarditis and Importance of Tissue Grinding: Case Report And Review, *J. Clin. Microbiol*, **32**:3043–3045.
- Harborne, J.B., 1987, *Metode Fitokimia Penuntun Cara Modern Menganalisis Tumbuhan* Terbitan 2, Diterjemahkan dari Bahasa Inggris oleh Padwinata, K., ITB, Bandung, pp 4 -15, 69-102, 155.

- Harper, J.C., 2004, An Update on The Pathogenesis *and* Management of *Acne vulgaris*, *J Am Acad Dermatol*, **51** (1) : 536-8.
- Hendra, R., Ahmad, S., Sukari, A., Shukor, M.Y. *and* Oskoueian, E. 2011, Flavonoid Analyses *and* Antimicrobial Activity of Various Parts of *Phaleria Macrocarpa* (Scheff). Boerl fruit, *Int J Mol Sci*, **12**: 3422-3431.
- Hidayah, N.D., 2016, 'Uji Aktivitas Ekstrak Metanol Klika Anak Dara (*Croton oblongus burm F*) terhadap Bakteri Penyebab Jerawat', *Skripsi*, Sarjana Farmasi, Universitas Islam Negeri Allaudin, Makassar.
- Holmberg, A., Lood, R., Morgelin, M., Soderquist, B., Hoist, E., Colin, M., Christensson, B. *and* Rasmussen, M. 2009, Biofilm Formation by *Propionibacterium acnes* is a Characteristic of Invasive Isolates. *Journal Compilation 2009 European Society of Clinical Microbiology and Infectious Diseases*, *Clin Microbiol Infect*, **15**: 787-795.
- Hostettmann, O. K., 1997, Potterat, Strategy for The Isolation *and* Analysis of Antifungal, Molluscicidal *and* Larvicidal Agents from Tropical Plants, *ACS Symp. Ser.*, **658**: 14-26.
- Hugo, W.B. *and* Russel, A.D. 1987, *Pharmaceutical Microbiology*, 4th ed, Blackwell Scientific Publication, London, 91-92.
- Hugo, W.B. *and* Russel, A.D., 2004, *Pharmaceutical Microbiology*, 7th Ed., Blackwell Scientific Publication, London.
- Jawetz., Melnick. *and* Adelberg's. 2010, *Medical microbiology*. 25th Edition. Terjemahan Penerbit Buku Kedokteran EGC. Mikrobiologi kedokteran jawetz, melnick, *and* adelberg. Edisi 25, Penerbit Kedokteran EGC. Jakarta, 151-236.
- Jousimies-Somer, H., Summanen, P., Citron, D., Baron, E., Wexler, W. *and* Finegold, S. 2002, *Wadsworth-KTL anaerobic bacteriology manual*, 6th ed. Star Publishing Co, Belmont, Ca.
- Ju, Q., Fimmel S., Hinz N., Stahlmann R., Xia L. *and* Zouboulis, C.C. 2011, 2,3,7,8 Tetrachlorodibenzo-*p*-dioxin Alters Sebaceous Gland Cell Differentiation *In Vitro*, *Exp. Dermatol*, **20**: 320-325.

- Jumiarni, W.I. dan Komalasari, O. 2017, Eksplorasi Jenis Dan Pemanfaatan Tumbuhan Obat Pada Masyarakat Suku Muna Di Permukiman Kota Wuna. *Trad. Med. J.*, **22(1)**: 45-56.
- Katzung, B.G., 2007, *Basic & Clinical Pharmacology, 10th ed.*, Lange Medical Publications, United States.
- Kementrian Kesehatan Republik Indonesia, 2009, *Farmakope Herbal Indonesia, 1st ed.*, Jakarta: Kementrian Kesehatan RI.
- Kemper, K.J., 2000, *Garlic (Allium sativum)* <http://www.mcp.edu/herbal/default.htm>. Diunduh 27 juli 2018
- Korenblum, E., Goulart, F.R.V., Rodrigues, I.A., Abreu, F., Lins, U. And Alves, P.B. 2013, Antimicrobial action and anti-corrosion effect against sulfate reducing bacteria by lemongrass (*Cymbopogon citratus*) essential oil and its major component, the citral, *AMB Express*. **3(44)**: 1-8.
- Korting, H.C, Lukacs, A, Vogt, N, Urban, J, Ehret, W. and Ruckdeschel, G. 1992, Influence of the pH-value on the Growth of *Staphylococcus epidermidis*, *Staphylococcus aureus* and *Propionibacterium acnes* in Continuous Culture, *Zentralblatt. Hygiene. und Umweltmedizin*. **193**:78-90.
- Lewis, K., 2001, Riddle of Biofilm Resistance, *Antimicrob Agents Chemotherapy*, **45**: 999-1007.
- Linfante, A, Allawh, R.M. and Allen, H.B. 2018, The Role of *Propionibacterium acnes* Biofilm in *Acne Vulgaris*. *J Clin Exp Dermatol Res* **9**: 439.
- Madduluri, S., Rao, K.B. and Sitaram, B., 2013, In Vitro Evaluation of Antibacterial Activity of Five Indigenous Plants Extracts against Five Bacteria Pathogens of Humans, *International Journal of Pharmacy and Pharmaceutical Sciences*, **203**:121-128.
- Manefield, M. M., Welch, M., Givskov, G.P.C., Salmond. and Kjelleberg, S. 2002. Halogenated furanones from the red alga, *Delisea pulchra* inhibit carbapenem antibiotik synthesis and exoenzym virulence factor 40 *Biofarmasi* **4 (1)**: 34-40.
- Marston, A., 2011, Thin-layer Chromatography with Biological Detection in Phytochemistry, *J. Chromatogr. A*, **1218**: 2676-2683.

- Matysiak, J. E., E, Weber-D ,abrowska B, Zaczek M, Mi ,edzybrodzki R, Letkiewicz S, Lusiak-Szelchowska M and Górski A., 2017, Prospects of Phage Application in the Treatment of Acne Caused by *Propionibacterium acnes*, *Front. Microbiol*, **8**:164.
- Melki., 2011, 'Uji Antibakteri Ekstrak *Gracillaria sp* (Rumput Laut) Terhadap Bakteri *Escherichia coli* dan *Staphylococcus aureus* Indralaya', diakses pada tanggal 8 September 2018, [http://eprints.unsri.ac.id/1257/2/MelkiujiantibakteriekstrakGracilaria sp.pdf](http://eprints.unsri.ac.id/1257/2/MelkiujiantibakteriekstrakGracilaria%20sp.pdf).
- Melnik, B. C., John, S. M. and Schmitz, G. 2011, Overstimulation of Insulin/IGF-1 Signaling by Western Diet May Promote Diseases of Civilization: Lessons Learnt From Laron Syndrome, *Nutr. Metab. (Lond.)*, **8**: 41.
- Meyer, F.D., 1996, Antibacterial activity of *Helichrysum pedunculatum* used in circumcision rites, *J. Ethnopharmacol.* **53**:51–54.
- Mikaili, P., Maadirad, S., Moloudizargari, M., Aghajanshakeri, S.H. and Sarahroodi, S. 2013, Therapeutic Uses and Pharmacological Properties of Garlic, Shallot, and Their Biologically Active Compounds, *Iran J Basic Med Sci*, **16**:1031-1048.
- Miratunnisa., Mulqie. dan Hajar, S. 2015, 'Uji Aktivitas Antibakteri Ekstrak Etanol Kulit Kentang (*Solanum Tuberosum* L.) terhadap *Propionibacterium acnes*', *Skripsi*, Program studi Farmasi, Fakultas MIPA Universitas Islam Bandung.
- Mulyani, Y.W.T., Hidayat, D., Isbiyantoro. dan Fatimah, Y. 2017, Ekstrak Daun Katuk (*Sauropus androgynus* (L) Merr) Sebagai Antibakteri Terhadap *Propionibacterium acnes* dan *Staphylococcus epidermidis*. *Jurnal Farmasi Lampung*, **6(2)** : 171-177
- Mustaqof dan Ahmad Aniq Noor., 2015, 'Sistem Pakar Untuk Mendiagnosis Penyakit Infeksi Menggunakan Forward Chaining', *Skripsi*, S1 Universitas Sebelas Maret, Surakarta.
- Naufalin, R., B. S. L. Jenie, F. Kusnandar, M. Sudarwanto, dan H. S. Rukmini., 2005, Aktivitas Antibakteri Ekstrak Bunga Kecambah Terhadap Bakteri Patogen dan Perusak Pangan, *Jurnal Teknologi dan Industri Pangan*, **16 (2)**: 119-125.

- Ngajow, M., Abidjulu, J. dan Kamu, V.S. 2013, Pengaruh Antibakteri Ekstrak Kulit Batang Matoa (*Pometia pinnata*) terhadap Bakteri *Staphylococcus aureus* secara *In vitro*, *Jurnal Mipa Unsrat Online*, **2(2)**: 128-132.
- Nugroho, R. N. 2013. ‘Terapi Topikal *Clindamycin* Dibandingkan dengan Niacinamide dan Zinc pada Acne Vulgaris.’ *Skripsi*, Program Studi Pendidikan Sarjana Kedokteran Fakultas Kedokteran Universitas Diponegoro, Semarang.
- Nuria, M.C., Faizatun, A. dan Sumantri. 2009, Uji Antibakteri Ekstrak Etanol Daun Jarak Pagar (*Jatropha curcas* L.) terhadap Bakteri *Staphylococcus aureus* ATCC 25923, *Escherichia coli* ATCC 25922, dan *Salmonella typhi* ATCC 1408, *Jurnal Ilmu – ilmu Pertanian*, **5**: 26 – 37.
- Oprica, C. and Nord, C.E. 2005, European Surveillance Study on The Antibiotic Susceptibility of *Propionibacterium acnes*. *Clin. Microbiol. Infect.*, **11**: 204–213.
- Paraje, M.G., 2011, Antimicrobial resistance in biofilm. Science against microbial pathogens : communicating current research and technological advances, *A Mendez-Vilaz* : 736-744.
- Parubak, A. S., 2013, ‘Senyawa Flavonoid yang Bersifat Antibakteri dari Akway (*Drimys beccariana* Gibbs)’, *Skripsi*, Jurusan Kimia F-MIPA UNIPA, Yogyakarta.
- Patrick, S. and McDowell, A. 2012, The Actinobacteria, part B. Order XII Propionibacteriales ord. nov., **2 (5)**: 1137–1155.
- Persson, T., Hansen, T.H., Rasmussen, T.B., Skindersoe, S.E., Givskov, M., and Nielsen, J., 2005, Rational design and synthesis of new quorum sensing inhibitors derived from acylated homoserine lactone and natural product from garlic, *Royal Society* **3 (2)**: 253-262.
- Poeloengan, M., Andriani, Susan, M.N., Komala, I. dan Hastina, M. 2007. Uji Daya Antibakteri Ekstrak Etanol Kulit Batang Bungur (*Langerstroemia speciosa* Pers) Terhadap *Staphylococcus aureus* dan *Escherichia coli* secara *in vitro*, Seminar Nasional Teknologi Peternakan dan Veteriner: 776-782.

- Powolny, A.A. and Singh, S.V. 2008, Multitargeted prevention and therapy of cancer by diallyl trisulfide and related *Allium* vegetable-derived organosulfur compounds, *Cancer Lett*, **229**:305-314.
- Prihandani S.S., Poeloengan, M. and Noor, S.M. 2015, Uji Daya Antibakteri Bawang Putih (*Allium sativum* L.) terhadap Bakteri *Staphylococcus aureus*, *Escherichia coli*, *Salmonella typhimurium* dan *Pseudomonas aeruginosa* dalam Meningkatkan Keamanan Pangan Antibacterial Activity Test Of Garlic (*Allium sativum*), *Informatika Penelitian*, **24**: 53–58.
- “*Propionibacterium acnes*.” Microbewiki.kenyon.edu. diakses pada 26 Juli 2018,dari https://microbewiki.kenyon.edu/images/thumb/0/0f/Propionibacterium_acnes.jpg/300px-Propionibacterium_acnes.jpg
- Rabin, N., Zheng, Y., Temeng, C. O., Du, Y., Bonsu E. and Sintim H.O. 2015, Review Part of Agents That Inhibit Bacterial Biofilm Formation, *Future Med, Chem*, **7(5)**: 647–671.
- Rahim, M.A., and Fordham, R. 1991. Effect of shade on leaf and cell size and number of epidermal cells in garlic (*Allium sativum*). *Annals of Botany*, **67**: 167-171.
- Reynolds, J.E.F., 1982, *Martindale the Extra Pharmacopeia*. 28th Edition, The Pharmaceutical Press, London: 688-689.
- Reynolds, T.D. dan Paul, A.R. 1996, *Unit Operations and Processes in Environmental Engineering*, Ed 2, PWS Publishing Company, Boston.
- Rezanka, T., Spizek, J. and Sigler, K. 2007, Medicinal Use of Lincosamides and Microbial Resistance to Them. *Anti-Infect. Agents Med. Chem.* **6**: 133–144.
- Rios, J.L., Recio M.C. and Villar A. 1988, Screening Methods for Natural Products With Antimicrobial Activity: A review of the literature, *J. Ethnopharmacol*, **23**: 127–149.
- Rohman, A. 2009, *Kromatografi Untuk Analisis Obat*, Graha Ilmu, Yogyakarta.

- Rosenvinge, E.C., O'May, G.O., Macfarlane, S., Macfarlane, G.T. and Shirliff, M.E. 2013, Minireview: Microbial Biofilms and Gastrointestinal Diseases, *Pathogens and Disease*, **67**: 25–38.
- Rukmana, R. 1995, *Budidaya Bawang Putih*, Penerbit Kanisius. Yogyakarta.
- Saifudin, A., Rahayu, A. dan Teruna, H.Y. 2011, *Standarisasi Bahan Obat Alam*, Vol. 2, Graha Ilmu, Yogyakarta.
- Santhosha, S.G., Jamunna, P. dan Prabhavathi, S.N. 2013. Bioactive Components of Garlic and their Physiological Role in Health Maintenance: review, *Food Biosci*, **3**: 59-74.
- Saptarini, M.N. dan Herawati, E.I. 2017, Development and Evaluation of Anti-Acne Gel Containing Garlic (*Allium Sativum*) Against *Propionibacterium acnes*. *Asian Journal of Pharmaceutical and Clinical Research*, **32(2)** : 72-78.
- Sarker, S.D., Latif, Z. and Gray, A.I. 2006, 'Natural Product Isolation', dalam Sarker, S.D., Latif, Z. Gray, A.I. *Methods in Biotechnology Natural Product Isolation*. 2nd ed., Humana Press Inc, New Jersey.
- Satria, D., 2013, Complementary and Alternative Medicine: A fact or promise, *Idea Nursing Journal*, **4(3)**: 44-49.
- Schlecht, S, Freudenberg, M.A. and Galanos, C., 1997, Culture and Biological Activity of *Propionibacterium acnes*, *Infection*, **25**:247–249.
- Schlunzen, F., Zarivach, R., Harms, J., Bashan, A., Tocilj, A., Albrecht, R., Yonath, A. and Franceschi, F. 2001, Structural Basis for the Interaction of Antibiotics with the Peptidyl Transferase Centre in Eubacteria, *Nature*, **413**: 814–821.
- Setiabudy., Rianto., Gunawan, G., Nafrialdi. dan Elysabeth. 2011, *Farmakologi dan Terapi*, Edisi 5, Departemen Farmakologi dan Terapeutik, FKUI, Jakarta.
- Sethi, J. dan Singh, J. 2015, Role of Medicinal Plants as Immunostimulants in Health and Disease. *Annals of Medicinal Chemistry and Research*, **1(2)**: 1009.

- Silverthorn, D. U., William, C.O., Claire, W.G., Andrew, C.S. dan Bruce, R.J. 2010, *Human Physiology: an Integrated Approach*, 5th: Pearson Benjamin Cummings, San Francisco.
- Simon AK, Hollander GA, and McMichael A., 2015, Evolution of the Immune System in Humans From Infancy to Old Age. *Proc. R. Soc. B* **28** (2): 20143085.
- Singhal, S., Singhal, N. and Agarwal, S. 2009, 'Pharmaceutical Analysis II', *Thin layer Chromatography*, 1sted, Pragati Prakashan, 98-111.
- Singh, R. 2002, *Chromatography*. Mittal Publications, New Delhi
- Spizek, J., Novotna, J. and Rezanka, T. 2004, Lincosamides: Chemical Structure, Biosynthesis, Mechanism of Action, Resistance, and Applications, *Adv. App., Microbiol*, **56**:121–154.
- Sukara, E. 2000, Sumber Daya Alam Hayati dan Pencarian Bahan Baku Obat (Bioprospekting). *Prosiding Simposium Nasional II Tumbuhan Obat dan Aromatik*, **23**: 31-37.
- Syamsiah, I.S. dan Tajudin, S. 2005, *Khasiat dan Manfaat Bawang Putih Raja Antibiotik Alami*, Argomedia Pustaka, Jakarta.
- Talaro, K. P. and Talaro, A. 2002, *Foundations in Microbiology*, 4th ed.,: The McGraw Hill Co, new york, USA.
- Tesoriere, L.M., Allegra, D., Butera. and Livrea, M.A. 1996, Absorption, Excretion, and Distribution of Dietary Antioxidant Betalains in Ldls: Potential Health Effects of Betalains in Humans. *The American Journal of Clinical Nutrition*, **80**(4): 941-945.
- Tjitrosoepomo, G. 2009, *Taksonomi Tumbuhan*, Gajah Mada University Press, Yogyakarta.
- Untari dan Ida. 2010, Bawang Putih Sebagai Obat Paling Mujarab Bagi Kesehatan. *Jurnal GASTER*, **7**(1).
- Voigt, R. 1995, *Buku Pelajaran Teknologi Farmasi*, diterjemahkan dari bahasa inggris oleh Soendani N. S. UGM Press, Yogyakarta.
- Wagner, H., Bladt, S. & Zgainski, E.M. 1984, *Plant Drug Analisis: A Thin Layer Chromatography Atlas*, Springer-Verlag, Berlin.

- Wibowo, S., 2006, *Budidaya Bawang Putih, Bawang Merah, Bawang Bombay*. Penebar Swadaya. Jakarta. Hal : 201.
- Wolkenstein, P., Misery, L., Amici, J.M., Maghina, R., Branchoux, S., Cazeau, C., Voisard, J.J. and Taieb, C. 2015, Smoking *and* Dietary Factors Associated With Moderate-to-Severe Acne in French Adolescents *and* Young Adults: Results of a Survey Using a Representative Sample, *Dermatology*, **230**, 34–39.
- Wulandari, M. 2014, 'Potensi Antibakteri dan Bioautografi Ekstrak Etanol Daun Bintaro (*Cerbera odollam Gaertn.*) Terhadap *Salmonella typhi* dan *Staphylococcus aureus*'. *Skripsi*. Sarjana Farmasi Universitas Muhamadiyah Surakarta, Surakarta.
- Yasir, Y., Yuniati, Y., Paramita, S., Zubaidah, M., Mu'ti, A., Danial, A. 2017, Analisis Bioautografi Dengan Kromatografi Lapis Tipis Pada Ekstrak Etanol Daun *Caesalpinia Sumatrana* Roxb, terhadap Bakteri Penyebab Infeksi Nosokomial, *Jurnal Sains dan Kesehatan*, 1(7).
- Yuniastuti, K. 2006. 'Ekstraksi dan Identifikasi Komponen Sulfida pada Bawang Putih (*Allium sativum* L.)'. *Skripsi*. Jurusan Kimia Fakultas Matematika dan Ilmu Pengetahuan Alam Universitas Negeri Semarang. Semarang.
- Zouboulis, C.C. 2014, Acne As a Chronic Systemic Disease. *Clin. Dermatol*, **32**: 389–396.