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Daftar Pustaka

Alamsyah, M.R.N., Pamungkas, S.J., Meganingrum, A.R., dan Nurafifah, L.S. (2020). Studi Anthophyta di Kota Magelang sebagai Sumber Pembelajaran Saintifik pada Biosistematika Tumbuhan. *Bioedusiana: Jurnal Pendidikan Biologi*, 5(2):160-175

Basu, C. (2015). PCR primer design. *Springer.*

Boluda, C. G., Rico, V. J., Divakar, P. K., Nadyeina, O., Myllys, L., McMullin, R. T., Zamora, J. C., Scheidegger, C., & Hawksworth, D. L. (2019). Evaluating methodologies for species delimitation: the mismatch between phenotypes and genotypes in lichenized fungi (Bryoria sect. Implexae, Parmeliaceae). *Persoonia*, 42, 75–100. https://doi.org/10.3767/persoonia.2019.42.04

Brodo, I. M., Sharnoff, S. D., & Sharnoff, S. (2001). *Lichens of North America*. Yale University Press.

Cho, S., Lee, H., Hong, S., & Lee, J. (2020). Study of Ecophysiological Responses of theAntarctic Fruticose Lichen Cladonia borealis Using the PAM Fluorescence System under Natural and Laboratory Conditions. *Plants*, 9. https://doi.org/10.3390/plants9010085.

Dandapat, S., & Paul, S. (2019). Secondary Metabolites from Lichen *Usnea longissima* and its Pharmacological Relevance. *Pharmacognosy Research*, 11(2); 103. https://doi.org/10.4103/pr.pr_111_18

Degnan, J.H., and Rosenberg, N.A. (2009). Gene tree discordance, phylogenetic inference and the multispecies coalescent. *Trends in Ecology and Evolution*, 24(6), 332-340.

Degtjarenko, P., Jüriado, I., Mandel, T., Tõrra, T., Saag, A., Scheidegger, C., & Randlane, T. (2019). Microsatellite based genetic diversity of the widespread epiphytic lichen *Usnea* subfloridana (Parmeliaceae, Ascomycota) in Estonia: comparison of populations from the mainland and an island. *MycoKeys*, 58, 27 - 45. https://doi.org/10.3897/mycokeys.58.36557.

Dobson, F.S. (1992). *Lichens An Illustrated Guided yo the British and Irish Species.* The Richmond Publishing Co. Ltd.

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Elkhateeb, W.A., ElpGhwas, D.E., and Daba, G. (2022). Lichens Uses Surprising Uses of Lichens that Improve Human Life. *Journal of Biomedical Research & Environmental Sciences*, *3*(2), 189–194. https://doi.org/10.37871/jbres1420

Eriksson, A., Gauslaa, Y., Palmqvist, K., Ekström, M., & Esseen, P. (2018). Morphology drives water storage traits in the globally widespread lichen genus *Usnea*. *Fungal Ecology*. https://doi.org/10.1016/j.funeco.2018.06.007.

Eymann, C., Lassek, C., Wegner, U., Bernhardt, J., Fritsch, O., Fuchs, S., Otto, A., Albrecht, D., Schiefelbein, U., Cernava, T., Aschenbrenner, I., Berg, G., Grube, M., & Riedel, K. (2017). Symbiotic Interplay of Fungi, Algae, and Bacteria within the Lung Lichen Lobaria pulmonaria L. Hoffm. as Assessed by State-of-the-Art Metaproteomics.. *Journal of proteome research*, 16 6, 2160-2173 . https://doi.org/10.1021/acs.jproteome.6b00974.

Esseen, J. Rytterstam, A. Atrena, B.G. Jonsson, Long-term dynamics of the iconic old-forest lichen *Usnea longissima* in a protected landscape, *Forest Ecology and Management*, Volume 546, (2023), 121369, ISSN 0378-1127, https://doi.org/10.1016/j.foreco.2023.121369.

Esseen, P. A., Gauslaa, Y., & Darholm, M. (2015). Traits driving water storage capacity of epiphytic lichens. *Basic and Applied Ecology*, 16(8), 652-661.

Faisal, S., Iqbal, Z., Shah, G. M., & Haq, F. (2026). Diversity, distribution, and environmental influences on epiphytic lichens in the Hazara Division, Khyber Pakhtunkhwa. *Ecological Frontiers*, *46*(1), 122–134. https://doi.org/10.1016/j.ecofro.2025.08.008

Feng, S., Bai, M., Rivas-González, I., Li, C., Liu, S., Tong, Y., Yang, H., Chen, G., Xie, D., Sears, K., Franco, L., Gaitán-Espitia, J., Nespolo, R., Johnson, W., Yang, H., Brandies, P., Hogg, C., Belov, K., Renfree, M., Helgen, K., Boomsma, J., Schierup, M., & Zhang, G. (2022). Incomplete lineage sorting and phenotypic evolution in marsupials.. *Cell*. https://doi.org/10.1016/j.cell.2022.03.034.

Friedl, T. and Büdel, B. (2008). Fotobions. In: Lichen Biology, 2e (ed. T.H. Nash III), 9–26. *Cambridge:* Cambridge University Press. https://doi.org/10.1017/CBO9780511790478.003.

Gagnon, E., Hilgenhof, R., Orejuela, A., McDonnell, A., Sablok, G., Aubriot, X.,

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Giacomin, L., Gouvêa, Y., Bragionis, T., Stehmann, J. R., Bohs, L., Dodsworth, S., Martine, C., Poczai, P., Knapp, S., & Särkinen, T. (2022). Phylogenomic discordance suggests polytomies along the backbone of the large genus Solanum. *American journal of botany*, 109(4), 580–601. https://doi.org/10.1002/ajb2.1827.

Gasulla, F., Herrero, J., Esteban-Carrasco, A., Ros-Barceló, A., Barreno, E., Zapata, J., & Guéra, A. (2012). Photosynthesis in Lichen: *Light Reactions and Protective Mechanisms*. https://doi.org/10.5772/26204.

Gardes, M., & Bruns, T. D. (1993). ITS primers with enhanced specificity for basidiomycetes–application to the identification of mycorrhizae and rusts. *Molecular Ecology*, 2(2), 113-118.

Gaya, E., Fernández-Brime, S., Vargas, R., Lachlan, R. F., Gueidan, C., Ramírez-Mejía, M., & Lutzoni, F. (2015). The adaptive radiation of lichen-forming Teloschistaceae is associated with sunscreening pigments and a bark-to-rock substrate shift. *National Academy of Sciences of the United States of America*, 112(37), 11600–11605. https://doi.org/10.1073/pnas.1507072112

Gerlach, A., Toprak, Z., Naciri, Y., Caviró, E., Da Silveira, R., & Clerc, P. (2019). New insights into the *Usnea* cornuta aggregate (Parmeliaceae, lichenized Ascomycota): Molecular analysis reveals high genetic diversity correlated with chemistry. *Molecular phylogenetics and evolution*, 131, 125-137 . https://doi.org/10.1016/j.ympev.2018.10.035.

Global Biodiversity Information Facility (GBIF). (2026). *GBIF Backbone Taxonomy*. Diakses melalui situs resmi GBIF (https://www.gbif.org) pada pendataan spesies *Usnea subfloridana* dan *Usnea glabrescens*.

Hale, M. E. (1969). *How to Know the Lichens*. Wm. C. Brown Company Publishers.

Hejda, M., Pyšek, P., & Jarošík, V. (2021 Impact of invasive and native dominants on species richnessand diversity of plant communities. *Ecology and Evolution*, 11(5), 2134-2145.

Heatwole, H. (1966). Moisture Exchange Between the Atmosphere and Some Lichens of the Genus Cladonia. *Mycologia*, 58(1), 148–156. https://doi.org/10.1080/00275514.1966.12018304.

Handayani, S. O., & Putri, D. H. (2021). Perbandingan Metode Fenol-Kloroform

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

dan Mini-Prep CTAB Untuk Isolasi DNA Tanaman Cabai (Capsicum annum L.). *Serambi Biologi*, 6(2), 37–41.

Hillis, D. M., Moritz, C., & Mable, B. K. (1996). *Molecular Systematics* (2nd ed.). Sinauer Associates.

Jannah, M., A'yun, Q., Rahmawati, A., Prasetya, E., and Hariri, M.R. (2022). *Usnea* in West Java: a Potential Source of Bioactive secondary metabolites, *berkala Penelitian Hayati,* 28(1):26-30.a

Jannah, M., and Afifah, N. (2020). Studi Kayu Angin (*Usnea* spp.) Sebagai Bahan Obat Tradisional. *Jurnal Teknosains*, 14(1):61-67.

Kauserud, H. 2023. ITS alchemy: On the use of ITS as a DNA marker in fungal ecology. *Fungal Ecology*. https://doi.org/10.1016/j.funeco.2023.101274.

Kelly, L. J., Hollingsworth, P. M., Coppins, B. J., Ellis, C. J., Harrold, P., Tosh, J., & Yahr, R. (2011). DNA barcoding of lichenized fungi demonstrates high identification success in a floristic context. *New Phytologist*, 191(1), 288-300.

Khehra, N., Padda, I., & Swift, C. 2023. Polymerase chain reaction(PCR). StatPearls

Kusmoro, J., Raihan, R., Hermawan, W., & Hasan, R. (2025). Diversity and phenetic relationship of lichen genus *Usnea* in Cisanti Forest area, Bandung District, West Java, Indonesia. *Biodiversitas*, *26*(2), 583–600. https://doi.org/10.13057/biodiv/d260207

Lange, O.L., Kilian, E., and Ziegler, H. (1986). Water vapor uptake and photosynthesis of lichens:performance differences in species with green and blue-green algae as phycobionts. *Oecologia* 71: 104–110.

Larena, I., Salazar, O., González, V., Julián, M. C., & Rubio, V. (1999). Design of a primer for ribosomal DNA internal transcribed spacer with enhanced specificity for ascomycetes. *Journal of Biotechnology*, 75(2-3), 187-194.

Lawrence, G. H. M. (1995). *Taxonomy of Vascular Plants and Principles of Phenetics*. Macmillan Publishers.

Lubek, P., Kukwa, M., & Jaroszewicz, B. (2021). Distribution and habitat preferences of fruticose lichens in old-growth forests under high humidity conditions. *Forest Ecology and Management*, 491, 119154.

Lücking, R., Nadel, M. R. A., Araujo, E. & Gerlach, A. (2020). Two decades of

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DNA barcoding in the genus *Usnea* (Parmeliaceae): how useful and reliable is the ITS?. *Plant and Fungal Systematics*, 65(2), 303–357. https://doi.org/10.35535/pfsyst-2020-0025.

Leavitt, S., Johnson, L., Goward, T., & St. Clair, L. (2011). Species delimitation in taxonomically difficult lichen-forming fungi: an example from morphologically and chemically diverse Xanthoparmelia (Parmeliaceae) in North America.. *Molecular phylogenetics and evolution*, 60 3, 317-32 . https://doi.org/10.1016/j.ympev.2011.05.012.

Llambí, L., Melfo, A., Gámez, L., Pelayo, R., Cárdenas, M., Rojas, C., Torres, J., Ramírez, N., Huber, B., & Hernández, J. (2021). Vegetation Assembly, Adaptive Strategies and Positive Interactions During Primary Succession in the Forefield of the Last Venezuelan Glacier. https://doi.org/10.3389/fevo.2021.657755.

Luzina, O.A, Salakhutdinov N.F. (2018). Usnic acid and its derivatives for pharmaceutical use: *A patent review (2000-2017). Expert Opin Ther Pat 28* (6): 477-491. DOI: 10.1080/13543776.2018.1472239.

Maddison, W., & Knowles, A. (2006). Inferring phylogeny despite incomplete lineage sorting. *Systematic biology*, 55 1, 21-30 . https://doi.org/10.1080/10635150500354928.

Margulis, L. and Fester, R. (ed.) 1991. Symbiosis as a Source of Evolutionary Innovation: Speciation and Morphogenesis. *MIT press.*

Martin, and Emilie J. Richards. (2019). The Paradox Behind the Pattern of Rapid Adaptive Radiation: How Can the Speciation Process Sustain Itself Through an Early Burst?. *Annual Review Ecology, Evolution, and Systematics.* 50:569-593. https://doi.org/10.1146/annurev-ecolsys-110617-062443

Meleshko,O., Michael D., Martin. (2021). Extensive Genome-Wide Phylogenetic Discordance Is Due to Incomplete Lineage Sorting and Not Ongoing Introgression in a Rapidly Radiated Bryophyte Genus, *Molecular Biology and Evolution*, 38 (7): 2750-2766. https://doi.org/10.1093/molbev/msab063

Mollah, A., Ashan, M.A., dan Khatimah, A.H. (2022). Uji Kualitas dan Kuantitas DNA Porang (Amorphophallus Muelleri Blume) pada Beberapa Kawasan di Sulawesi Selatan. *Jurnal Agritechno*, 15(01), 2656-2413.

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
Aghniya Faza Kencana Dewi, Ludmilla Fitri Untari, S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Monge-Najera, J. (2019). Relative Humidity, Temperature, Substrate Type, and Height of Terrestrial lichens in a Tropical Paramo. *Revista de Biología Tropical*, 67(4), 856-868.

Moore, E.R.B., Mihaylova, S.A., Vandamme, P, and Dijkshoorn. (2016). Microbial systematics and taxonomy: relevance for a microbial commons. *Research in Microbiology*, 161(6):430-438.

Muriningsih, dan Mafazaa, H. (2016). Jenis-jenis Lichen di Kampus Undip Semarang. *Bioma*, 18(1):20-29.

Muvidha, Azmil. (2020). Lichen Di Jawa Timur. Tulungagung: *Academia Pustaka.*

Nascimbene, P. L. Nimis & S. Ravera (2013) Evaluating the conservation status of epiphytic lichens of Italy: A red list, *Plant Biosystems - An International Journal Dealing with all Aspects of Plant Biology: Official Journal of the Societa Botanica Italiana*, 147:4, 898-904, DOI: 10.1080/11263504.2012.748101

Nasrulhaq, B., and Sulistyaningsih, L. (2018). Lichenes: Keanekaragaman, Ekologi, dan Manfaatnya. *IPB Press.*

Nash, T.H., Ryan, B.D., Gries, C., Bungartz, F., (eds.) 2007. Lichen Flora of the Greater Sonoran Desert Region. Vol 3.

Nash, T. H. (2012). *Lichen Biology* (2nd ed.). Cambridge University Press.

Nebore, I. D. Y., Lefaan, P. Th., Massora, M., Nunaki, J. H., Dewi, R., & Fatem, S. M. (2025). Morphology of Lichen Fungi in Amban Regency, Manokwari, West Papua. *Jurnal Biologi Tropis*, *25*(4), 5093–5104. https://doi.org/10.29303/jbt.v25i4.9973

Papakostas, S., Michaloudi, E., Proios, K., Brehm, M., Verhage, L., Rota, J., Peña, C., Stamou, G., Pritchard, V., Fontaneto, D., & Declerck, S. (2016). Integrative Taxonomy Recognizes Evolutionary Units Despite Widespread Mitonuclear Discordance: Evidence from a Rotifer Cryptic Species Complex.. *Systematic biology*, 65 3, 508-24 . https://doi.org/10.1093/sysbio/syw016

Pratama, A., & Trianto, M. (2020). *Diversity of Lichen in Mangrove Forest of Tomoli Village Parigi Moutong Regency Keanekaragaman Lichen di Hutan Mangrove Desa Tomoli Kabupaten Parigi Moutong*. https://doi.org/10.32938/jbe

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Prateeksha, Paliya, B. S., Bajpai, R., Jadaun, V., Kumar, J., Kumar, S., Upreti, D. K., Singh, B. R., Nayaka, S., Joshi, Y., & Singh, B. N. (2016). The genus *Usnea*: A potent phytomedicine with multifarious ethnobotany, phytochemistry and pharmacology. In *RSC Advances* (Vol. 6, Number 26, pp. 21672–21696). Royal Society of Chemistry. https://doi.org/10.1039/c5ra24205c

Reddy SD, Siva B, Kumar K, Babu VSP, Sravanthi V, Boustie J, Nayak VL, Tiwari AK, Rao CHV, Sridhar B, Shashikala P, Babu KS. (2019). Comprehensive analysis of secondary metabolites in *Usnea longissima* (Lichenized Ascomycetes, Parmeliaceae) Using UPLCESI-QTOF-MS/MS and pro-apoptotic activity of barbatic acid. *Molecules* 24 (12): 2270. DOI: 10.3390/molecules24122270.

Roziaty, E., and Utari, R. T. (2017). Jenis dan Morfologi Lichen Fruticose di Kawasan Hutan Sekipan Desa Kalisoro Tawangmangu Karanganyar Jawa Tengah. *Biology Education Conference*, 14(1):114-117.

Salgado F, Albornoz L, Cortéz C, Stashenko E, Urrea-Vallejo K, Nagles E, Galicia-Virviescas C, Cornejo A, Ardiles A, Simirgiotis M, GarcíaBeltrán O, Areche C. (2018). Secondary metabolite profiling of species of the genus *Usnea* by UHPLC-ESI-OT-MS-MS. *Molecules* 23 (1): 54. DOI: 10.3390/molecules23010054.

Salis, V.M., Tjong, D.H., Syaifullah., and Roesma, D.I. (2025). Morphology and molecular studies to reveal the taxonomic status of endemic fish Barbonymus belinka of Lake Singkarak, West Sumatra, Indonesia. *Biodiversitas*, 26(2):536-550. DOI: 10.13057/biodiv/d260203

Sanders, W. B. (2001). Lichens: Interface Between Mycology and Plant Morphology. *Bioscience* (51): 1025-1035,

Sanger, F., S. Nicklen, and A.R. Coulson. (1997). DNA sequencing with chain terminating inhibitors. *Proc. Nat. Acad. Sci. USA* 74: 5463–5467. doi:10.1073/pnas.74.12.5463.

Sayyari,E. and Mirarab,E. (2017). Fast Coalescent-Based Computation of Local Branch Support from Quartet Frequencies, *Molecular Biology and Evolution*, Volume 33, Issue 7, July 2016, Pages 1654–1668,

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
Aghniya Faza Kencana Dewi, Ludmilla Fitri Untari, S.Si., M.Si.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

https://doi.org/10.1093/molbev/msw079

Schoch, C. L., Seifert, K. A., Huhndorf, S., Robert, V., Spouge, J. L., Levesque, C. A., & Chen, W. (2012). Nuclear ribosomal internal transcribed spacer (ITS) region as a universal DNA barcode marker for Fungi. *Proceedings of the National Academy of Sciences (PNAS)*, 109(16), 6241-6246.

Seymour, F.A.,Crittenden, P.D., Wirtz, N., Ovstedal, D.O., Dyer, P.S., and Lumbsch, H.T. (2007). Phylogenetic and Morphological Analysis of Antartic Lichen-forming *Usnea* Species in the Group Neuropogon. *Antarctic Science*, 19(1):1-12.

Singh, G. 2009. *Plant Systematic: An Integrated Approach.* Science Publisher, Inc. New Hampshire, USA.

Steinová, J., Holien, H., Košuthová, A., & Škaloud, P. (2022). An Exception to the Rule? Could Fotobion Identity Be a Better Predictor of Lichen Phenotype than Mikobion Identity?. *Journal of Fungi*, 8. https://doi.org/10.3390/jof8030275.

Strong, W. L. (2016). Biased richness and evenness relationships within Shannon–Wiener index values. *Ecological Indicators*, 67, 703-713.

Temu SG, Clerc P, Nadel MRA, Tibell L, Tibuhwa DD, Tibell S. (2022). Molecular, morphological and chemical variation of the *Usnea*pectinata aggregate from Tanzania, São Tomé and Príncipe. *Lichenologist* 54 (5): 291-298. DOI: 10.1017/S0024282922000251.

Truong C, Bungartz F, Clerc P. (2011). The lichen genus *Usnea* (Parmeliaceae) in the tropical Andes and the Galapagos: Species with a red-orange cortical or subcortical pigmentation. *Bryologist* 114: 477-503. DOI: 10.1639/0007-2745-114.3.477.

Truong, Pradeep K. Divakar, Rebecca Yahr, Ana Crespo. (2013). Philippe Clerc, Testing the use of ITS rDNA and protein-coding genes in the generic and species delimitation of the lichen genus *Usnea* (Parmeliaceae, Ascomycota), Molecular Phylogenetics and Evolution, Volume 68, Issue 2, Pages 357-372, ISSN 1055-7903, https://doi.org/10.1016/j.ympev.2013.04.005. (https://www.sciencedirect.com/science/article/pii/S1055790313001541).

Untari, L. F. (2024). The biology of lichen. In A. K. Das, A. Sharma, D. Kathuria, M. J. Ansari, & G. Bhardwaj (Eds.), *Chemistry, biology and pharmacology of*

UNIVERSITAS
GADJAH MADA
Keanekaragaman Spesies dan Filogenetik Usnea Dill. ex Adans. di Bukit Tritis dan Bukit Srumbung Taman Nasional Gunung Merapi
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Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

lichen (1st ed., pp. 13–19). John Wiley & Sons Ltd.

Vences, M., Miralles, A., & Dufresnes, C. (2024). Next-generation species delimitation and taxonomy: Implications for biogeography. *Journal of Biogeography*, 51, 1709 - 1722. https://doi.org/10.1111/jbi.14807

Wang H, Xuan M, Huang C, Wang C. 2022. Advances in research on bioactivity, toxicity, metabolism, and pharmacokinetics of usnic acid in vitro and in vivo. *Molecules* 27 (21): 7469. DOI: 10.3390/molecules27217469

White, T. J., Bruns, T., Lee, S., & Taylor, J. (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In *PCR Protocols: A Guide to Methods and Applications* (pp. 315-322). Academic Press.

Widodo, W.T. (2025). Komponen Tahapan dan Variasi Polimerase Chain Reaction. *Jurnal Kesehatan Masyarakat*, 6(1) : 3350 - 3357.

Wirtz, N., Printzen, C., Sancho, L. G., & Lumbsch, H. T. (2006). The phylogeny and classification of *Neuropogon* and *Usnea* (Parmeliaceae, Ascomycota) revisited. *Taxon*, 55(2), 367-376.

Yasmin, F., & Jabin, R. (2024). Physiology of Lichen. In A. K. Das, A. Sharma, D. Kathuria, M. J. Ansari, & G. Bhardwaj (Eds.), *Chemistry, Biology and Pharmacology of Lichen* (1st ed., pp. 71–80). John Wiley & Sons Ltd.

Yuliani, R., Imaningsih, W., & Yuwati, T. W. (2021). Lichen as bioindicator of air quality at buffer zone of Banjarbaru town. *Jurnal Galam*, *2*(1), 54–65. https://doi.org/10.20886/glm.2021.2.1.54-65

Zhang, Z., Liu, G., & Li, M. (2023). Phylotranscriptomic discordance is best explained by incomplete lineage sorting within Allium subgenus Cyathophora and thus hemiplasy accounts for interspecific trait transition. *Plant Diversity*, 46, 28 - 38. https://doi.org/10.1016/j.pld.2023.07.004.