UNIVERSITAS
GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

Abas, A., Din, L., & Nuang, G. (2020). Diversity, composition and distribution of lichens along elevational gradients in the tropical mountain forest of Gunung Nuang, Selangor, Malaysia. *Eco.Mont*, 13(1), 4–11. https://doi.org/10.1553/eco.mont-13-1s4.

Abdullah, A., & Reyhan, M. (2017). Karakterisasi dan Identifikasi Senyawa aktif ekstrak pigmen telur keong mas. *Jurnal Pengolahan Hasil Perikanan Indonesia*, 20(2), 286-295.

Ahmadjian, V. (1993). *The lichen symbiosis*. John Wiley & Sons.

Ahmed, S., Ibrahim, M., Nantasenamat, C., Nisar, M. F., Malik, A. A., Waheed, R., & Alam, M. K. (2022). Pragmatic applications and universality of DNA barcoding for substantial organisms at species level: a review to explore a way forward. *BioMed Research International*, 2022(1), 1846485.

Amalia, R., & Trimulyono, G. (2019). Aktivitas Antibakteri Ekstrak Lichen *Usnea subfloridana* terhadap Pertumbuhan Bakteri *Escherichia coli* FNCC 0091 dan Staphylococcus aureus FNCC 0047. *LenteraBio: Berkala Ilmiah Biologi*, 8(2).

Articus, K. (2004a). Neuropogon and the phylogeny of *Usnea* s.l. (Parmeliaceae, Lichenized Ascomycetes). *Taxon*, 53(4), 925–934. https://doi.org/10.2307/4135560.

Articus, K. (2004b). Phylogenetic Studies in *Usnea* (*Parmeliaceae*) and Allied Genera. Acta *Universitatis Upsaliensis*, 120.

Articus, K., Mattsson, J. E., Tibell, L., Grube, M., & Wedin, M. (2002). Ribosomal DNA and β-tubulin data do not support the separation of the lichens *Usnea florida* and *U. Subfloridana* as distinct species. *Mycological Research*, 106(4), 412–418.

Arup, U., Ekman, S., Grube, M., Mattsson, J.-E., & Wedin, M. (2007). The sister group relation of *Parmeliaceae (Lecanorales, Ascomycota). Mycologia,* 99(1), 42–49.

Asahina, Y. (l968c). Lichenologische notizen On Subsect. Angulosae Duvign. of the Sect. *Elongatae* Mot. of the Genus Us nea. J. Jpn. Bot. 43: 495-498, pl. 24.

Asplund, J., van Zuijlen, K., Roos, R. E., Birkemoe, T., Klanderud, K., Lang, S. I., & Nybakken, L. (2021). Contrasting responses of plant and lichen carbon-based secondary compounds across an elevational gradient. *Functional Ecology*, 35(2), 330-341.

Baldwin, B. G., Sanderson, M. J., Porter, J. M., Wojciechowski, M. F., Campbell, C. S., & Donoghue, M. J. (1995). The its Region of Nuclear Ribosomal DNA: A Valuable Source of Evidence on Angiosperm Phylogeny. *Annals of the Missouri Botanical Garden*, 82(2),

Baltzis, A., Santus, L., Langer, B. E., Magis, C., de Vienne, D. M., Gascuel, O., & Notredame, C. (2025). multistrap: boosting phylogenetic analyses with structural information. *Nature Communications*, 16(1), 293.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Batirov, E. K., & Malikov, V. M. (1980). Haploside A—A new acylated flavonol glycoside from *Haplophyllum perforatum*. *Chemistry of Natural Compounds*, 16(3), 242-245.

Bickford D, Lohman DJ, Sodhi NS, Ng PKL, Meier R, Winker K, Ingram KK, Das I (2007) Cryptic species as a window on diversity and conservation. *Trends Ecol Evol* 22:148

Bidartondo, M. I., Bruns, T. D., Blackwell, M., Edwards, I., Taylor, A. F. S., Horton, T. R., & Kõljalg, U. (2008). Preserving accuracy in GenBank. *Science*, 319(5870): 1616.

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

Boustie, J., & Grube, M. (2005). Lichens—a promising source of bioactive secondary metabolites. *Plant Genetic Resources*, 3(2), 273-287.

Bozokalfa, M.K., Eşiyok, D. and Turhan, K. (2009). Patterns of phenotypic variation in a germplasm collection of pepper (*Capsicum annuum* L.) from Turkey. *Spanish J. Agric. Res*. 7(1): 83-95.

Bradshaw, M., Grewe, F., Thomas, A., Harrison, C. H., Lindgren, H., Muggia, L., St. Clair, L. L., Lumbsch, H. T., & Leavitt, S. D. (2020). Characterizing the ribosomal tandem repeat and its utility as a DNA barcode in lichen-forming fungi. *BMC Evolutionary Biology*, 20(1), 1–11. https://doi.org/10.1186/s12862-019-1571-4.

Bridge, P. D., Roberts, P. J., Spooner, B. M., & Panchal, G. (2003). On the unreliability of published DNA sequences. *New Phytologist*, 160(1): 43–48.

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

Bruns, T. D., Lee, S. B., & Taylor, J. W. (1990). White,T . J., T. D. Bruns, S. B. Lee, and J. W. Taylor. *Amplification and direct sequencing of fungal ribosomal RNA Genes for phylogenetics.* January.

Bui, V. M., Duong, T. H., Nguyen, T. A. M., Nguyen, T. N. V., Nguyen, N. H., Nguyen, H. H., & Huynh, B. L. C. (2022). Two new phenolic compounds from the Vietnamese lichen Parmotrema tinctorum. *Natural product research*, 36(13), 3429-3434.

Bungartz, F., Truong, C., de los Angeles Herrera-Campos, M., & Clerc, P. (2018). The genus *Usnea* (*Parmeliaceae, Lecanoromycetes*) in the Galapagos Islands. *Herzogia*, 31(p1), 571-629.

Campbell; Reece; Urry; Cain; Wasserman; Minorsky; & Jackson. (2008). *Biologi Edisi Kedelapan Jilid 2*. Jakarta: Penerbit Erlangga.

Cao, S., Zhang, J., Zheng, H., Liu, C., & Zhou, Q. (2015). Photosynthetic performance in Antarctic lichens with different growth forms reflect the diversity of lichenized algal adaptation to microhabitats. *Polish Polar Research*, 36(2), 175–188. https://doi.org/10.1515/popore-2015-0012.

Casano, L. M., del Campo, E. M., García-Breijo, F. J., Reig-Armiñana, J., Gasulla, F., del Hoyo, A., Guéra, A., & Barreno, E. (2011). Two Trebouxia algae with different physiological

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

performances are ever-present in lichen thalli of Ramalina farinacea. *Symbiosis,* 55, 43–52. https://doi.org/10.1007/s13199-011-0148-4

Castaneta, G., Sepulveda, B., Vargas, R., Garcia-Beltran, O., Simirgiotis, M., & Areche, C. (2023). A sustainable application for the extraction of lichen metabolites from *Usnea cornuta*: nontargeted metabolomics and antioxidant activity. *Natural Product Research*, 37(12), 2076-2082.

Castillo, S., Gopalacharyulu, P., Yetukuri, L., & Orešič, M. (2011). Algorithms and tools for the preprocessing of LC–MS metabolomics data. *Chemometrics and Intelligent Laboratory Systems*, 108(1), 23-32.

Ceolin, G.B. and Miotto, S.T.S. 2011. Checking the status of infraspecific taxa within *Galactia jussiaeana (Fabaceae)* using Berg‟s correlation-pleiads hypothesis. *Phytotaxa* 25: 39-48.

Chen, H., & Skylaris, C. K. (2021). Analysis of DNA interactions and GC content with energy decomposition in large-scale quantum mechanical calculations. *Physical Chemistry Chemical Physics*, 23(14), 8891-8899.

Chi, H. B. L., Van Muoi, B., Thu, N. T. H., & Phung, N. K. P. (2021). A new phenolic compound from the lichen *Parmotrema praesorediosum* (Nyl.) Hale. *Vietnam Journal of Chemistry*, 59(1), 47-51.

Clerc, 1998. Species Concepts In The Genus *Usnea (Lichenized Ascomycetes*). *Lichenologist* 30(4-5): 321–340.

Clerc, P. (2004) Notes on the genus Usnea Adanson. II. *Bibliotheca Lichenologica* 88: 79–90.

Clerc, P. (2006). Synopsis of *Usnea (lichenized Ascomycetes)* from the Azores with additional information on the species in Macaronesia. *Lichenologist*, 38(3), 191–212. https://doi.org/10.1017/S002428290600569X

Clerc, P., & Naciri, Y. (2021). *Usnea dasopoga* (Ach.) Nyl. And U. barbata (L.) F. H. Wigg. (*Ascomycetes, Parmeliaceae*) are two different species: A plea for reliable identifications in molecular studies. *Lichenologist*, 53(3), 221–230.

Clerc, P., & Volker, O. T. T. E. (2018). *Usnea viktoriana (Ascomycota, Parmeliaceae),* a new European taxon of the *Usnea barbata*-dasopoga group, with a key to the shrubby-subpendulous sorediate *Usnea* species in Europe. *The Lichenologist*, 50(5), 513-527.

Crespo, A., & Lumbsch, H. T. (2010). Cryptic species in lichen-forming fungi. *IMA fungus*, 1,167-170.

Crespo, A., & Pérez-Ortega, S. (2009). Cryptic species and species pairs in lichens:a discussion on the relationship between molecular phylogenies and morphological characters. *In Anales del Jardín Botánico de Madrid* (Vol. 66, No. S1, pp. 71-81).

Crespo, A., Bridge, P. D., & Hawksworth, D. L. (1999). *A re-assessment of the family Alectoriaceae*. The Lichenologist, 31(5), 431–440.

Crespo, A., Divakar, P. K., & Hawksworth, D. L. (2011). Generic concepts in parmelioid lichens, and the phylogenetic value of characters used in their circumscription. *Lichenologist*, 43(6), 511–535. https://doi.org/10.1017/S0024282911000570.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Crespo, A., Kauff, F., Divakar, P. K., del Prado, R., Pérez-Ortega, S., de Paz, G. A., Ferencova, Z., Blanco, O., Roca-Valiente, B., Núñez-Zapata, J., Cubas, P., Argüello, A., Elix, J. A., Esslinger, T. L., Hawksworth, D. L., Millanes, A., Molina, M. C., Wedin, M., Ahti, T., Thorsten Lumbsch, H. (2010). Phylogenetic generic classification of parmelioid lichens (*Parmeliaceae, Ascomycota*) based on molecular, morphological and chemical evidence. *Taxon*, 59(6), 1735–1753. https://doi.org/10.1002/tax.596008.

Dal Grande, F., Rolshausen, G., Divakar, P. K., Crespo, A., Otte, J., Schleuning, M., & Schmitt, I. (2018). *Environment and host identity structure communities of green algal symbionts in lichens*. *New Phytologist, 217*(1), 277–289.

Das, S. and Deb, B. 2015. DNA barcoding of fungi using Ribosomal ITS Marker for genetic diversity analysis: A Review. Int. J. Pure App. *Biosci*. 3 (3):160-167.

De Mendoza, D., & Pilon, M. (2019). Control of membrane lipid homeostasis by lipid-bilayer associated sensors: a mechanism conserved from bacteria to humans. *Progress in Lipid Research*, 76, 100996.

Dědková, K., Vančurová, L., Muggia, L., & Steinová, J. (2025). The plurality of photobionts within single lichen thalli. *Symbiosis*, 1-29.

Deduke, C., Timsina, B., & D., M. (2012). Effect of Environmental Change on Secondary Metabolite Production in Lichen-Forming Fungi. *International Perspectives on Global Environmental Change, February*. https://doi.org/10.5772/26954

Dekawati, D. (2017). *Karakteristik morfologi lichen corticolous di kawasan Hutan Sekipan Desa Kalisoro, Tawangmangu, Kabupaten Karanganyar, Provinsi Jawa Tengah* (Skripsi Sarjana). Universitas Muhammadiyah Surakarta.

Del-Prado, R., Cubas, P. Lumbsch, H.T, Divakar, P.K, Blanco, O., De Paz, G.A., Molina, M.C., & Crespo, A. 2010. Genetic distances within and among species in monophyletic lineages of *Parmeliaceae (Ascomycot*a) as a tool for taxon delimitation. *Molecular Phylogenetic & Evolution*. 56: 125-133.

Del-Prado, R., Schmitt, I., Kautz, S., Palice, Z., Lücking, R., Lumbsch, H.T. 2006. Molecular data place *Trypetheliaceae* in D*othideomycetes*. *Mycological Research* 110, 511–520.

Díaz, R., Argüello, G. G., Filippini, E., Peralta, M., & Rodríguez, J. M. (2026). Phenotypic plasticity in two saxicolous lichen species: elevation and microsite effects on physiological and biochemical responses. *Fungal Ecology*, 81, 101497.

Divakar, P. K., Crespo, A., Wedin, M., Leavitt, S. D., Hawksworth, D. L., & Lumbsch, H. T. (2006). ITS sequence data and phylogenetic relationships in lichenized fungi. *Mycological Research*, 110, 1459–1471.

Divakar, P. K., Leavitt, S. D., Molina, M. C., Del-Prado, R., Lumbsch, H. T., & Crespo, A. (2016). A DNA barcoding approach for identification of hidden diversity in *Parmeliaceae (Ascomycota)*: Parmelia sensu stricto as a case study. *Botanical Journal of the Linnean Society,* 180(1), 21–29. https://doi.org/10.1111/boj.12358

Djohan, T. S., Maulidika, A. I., & Agung, P. (2025). Profil Hutan Pegunungan Kamojang, Jawa Barat. Ekologia: *Jurnal Ilmiah Ilmu Dasar dan Lingkungan Hidup*, 25(1), 29-42.

Dobson, F.S. 1992. *Lichens An Illustrated Guide to The British and Irish Species*. Singapore: Stamford Press.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Doering, M., and Piercey-Normore, M. D. (2009). Genetically divergent algae shape an epiphytic lichen community on Jack Pine in Manitoba. *The Lichenologist* 41, 69-80.

Dulay, R. M. R., Cabrera, E. C., Kalaw, S. P., & Reyes, R. G. (2020). Nucleotide sequencing and identification of wild mushrooms from the Philippines. *Biocatalysis and Agricultural Biotechnology*, 27, 101666.

Dwarakanath, P. R., Abinaya, K., Nagasathya, K., Meenakumari, S., Gopinath, S. C. B., & Raman, P. (2024). Profiling secondary metabolites from lichen *Parmotrema perlatum* and antibacterial and antioxidant potentials. *Biomass Conversion and Biorefinery, 14*, 16461–16471.

El Karkouri, K., Murat, C., Zampieri, E., & Bonfante, P. (2007). Identification of *internal transcribed spacer sequence* motifs in truffles: A first step toward their DNA bar coding. *Applied and Environmental Microbiology*, 73(16), 5320–5330. https://doi.org/10.1128/AEM.00530-07.

Elix, J. A. (2014). A catalogue of standardized chromatographic data and biosynthetic relationships for lichen substances. *Canberra: The Author*.

Engelen, A., et al. (2010). Phylogenetic relationships of photobionts associated with *Usnea lambii* inferred from ITS rDNA sequences. *Lichenologist*, 42, 1–12.

Fatima, S., PA, A., KC, R., Sharma, B., Gaikwad, S., Mohan, A., & Sequeira, S. (2021). Deciphering the symbiosis of endemic *Usnea ghattensis* and their photobiont *Trebouxia* sp. through molecular tools from the northern Western Ghats, India. *Microbial Biosystems*, 6(2), 30-42.

Fernández-Moriano, C., Gómez-Serranillos, M. P., & Crespo, A. (2016). Antioxidant potential of lichen species and their secondary metabolites. A systematic review. *Pharmaceutical Biology*, 54(1), 1–17. https://doi.org/10.3109/13880209.2014.1003354.

Friedl, T., Besendahl, A., Pfeiffer, P., & Bhattacharya, D. (2000). The distribution of group I introns in lichen algae suggests that lichenization facilitates intron lateral transfer. *Molecular phylogenetics and evolution*, 14(3), 342-352.

Galloway, D. J. (2007). *Flora of New Zealand Lichens* (Revised 2nd ed.). Manaaki Whenua Press.

Gerlach, A., Clerc, P., Lücking, R., Moncada, B., Nobleza, J. C., Ohmura, Y., & Dal Forno, M. (2023). The genus *Usnea (Parmeliaceae, Ascomycota)* in the southern Philippines: a first phylogenetic approach. *The Lichenologist*, 55(6), 451-480.

Gerlach, A. da C. L., Clerc, P., & Borges da Silveira, R. M. (2017). *Taxonomy of the corticolous, shrubby, esorediate, neotropical species of Usnea Adans. (Parmeliaceae) with an emphasis on southern Brazil*. The Lichenologist, 49(3), 199–238.

Gerlach, A., Rodrigues, D., Rodriguez, J. M., Rojas, C., Temu, S., & Kantvilas, G. (2020). A tribute to Philippe Clerc: an eminent and multitalented lichenologist in Switzerland. *Plant and Fungal Systematics,* 65(2), 240-246.

Gianini, A. S., Torres, J. M., Honda, N., Lorenz, A., Spielmann, A., & Micheletti, A. C. (2025). Chemotaxonomic Studies on Some *Stereocaulon (Stereocaulaceae, Lichenized Ascomycota)* from Southern South America and Antarctica. *Orbital: The Electronic Journal of Chemistry*, 456-463.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Goga, M., Elečko, J., Marcinčinová, M., Ručová, D., Bačkorová, M., & Bačkor, M. (2020). Lichen metabolites: an overview of some secondary metabolites and their biological potential. *Co-evolution of secondary metabolites,* 175-209.

Gower, J. C. (1971). A general coefficient of similarity and some of its properties. *Biometrics, 27*(4), 857–871.

Guiry, M. D., and Guiry, G. M. (2013). *AlgaeBase*. Vol. 2013. World-wide electronic publication, National Univeresity of Ireland, Galway.

Gunasekaran, S., Pillai Rajan, V., Ramanathan, S., Murugaiyah, V., Samsudin, M. W., & Din, L. (2016). Antibacterial and Antioxidant Activity of Lichens *Usnea rubrotincta*, Ramalina dumeticola, Cladonia verticillata and Their Chemical Constituents. *Malaysian Journal of Analytical Science*, 20(1), 1–13. https://doi.org/10.17576/mjas-2016-2001-01

Hale, M. E. (1981). Pseudocyphellae and pored epicortex in the Parmeliaceae: their delimitation and evolutionary significance. *The Lichenologist*, 13(1), 1-10.

Hale, M.E. 1969. *How to Know the Lichens*. United State of America: WM.c. Brown Company.

Hale, M.E. 1974. *The Biology of Lichens*. London: Edward Arnold Ltd.

Harmita, K.; Harahap, Y.; Supandi. (2019*). Liquid Chromatography*-Tandem Mass Spectrometry (LC-MS/MS). Jakarta: PT. ISFI Penerbitan.

Hawrył, A., Hajnos-Stolarz, A., Hawrył, M., & Bogucka-Kocka, A. (2019). TLC fingerprint with chemometrics and antioxidant activity of selected lichens. *Journal of Liquid Chromatography and Related Technologies*, 42(9–10), 302–310.

Hillis, D. M., C. Moritz, & B. K. Marble. 1996. *Molecular Systematics 2nd Ed*. Sinnauer Associates Pub.: USA.

Hofstetter, V., Buyck, B., Eyssartier, G., Schnee, S., & Gindro, K. (2019). The unbearable lightness of sequenced-based identification. *Fungal Diversity*, 96: 243–284.

Honda, N. K., Pavan, F. R., Coelho, R. G., de Andrade Leite, S. R., Micheletti, A. C., Lopes, T. I. B., Misutsu, M. Y., Beatriz, A., Brum, R. L., & Leite, C. Q. F. (2010). Antimycobacterial activity of lichen substances. P*hytomedicine*, 17(5), 328–332.

Huang, J., Liu, Y., Zhu, T., & Yang, Z. (2021). The asymptotic behavior of bootstrap support values in molecular phylogenetics. *Systematic biology*, 70(4), 774-785.

Huneck, S & Yoshimura. 1999. The Significance of Lichens and their Metabolites. *Naturwissenschaften.* 86: 559-576.

Jadhav, R., Chauhan, P., Singh, V. P., & Kumar, S. (2025). Alkaloids: Potent Defenses Against Plant Pathogens. *In Plant Secondary Metabolites* (pp. 52-81). CRC Press.

Jannah, M. (2014). *Variasi Genetik dan Identifikasi Usnea spp. Berdasarkan Karakter Morfologis dan Molekular (Doctoral dissertation, Universitas Gadjah Mada).*

Jannah, M. I., Rahayu, D. A., Sari, M. S., & Untari, L. F. (2019). The Fruticose Lichens in the Forest Tahura (Taman Hutan Raya) R. Soeryo, East Java. *Biotropika: Journal of Tropical Biology*, 7(2), 63-66.

UNIVERSITAS
GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Jannah, M., & Afifah, N. (2020). Studi Kayu Angin (Usnea spp.) Sebagai Bahan Obat Tradisional Studi Kasus: Pasar Tradisional Kota Jakarta. *Teknosains: Media Informasi Sains Dan Teknologi*, 14(1), 61– 67.

Jannah, M., A`yun, Q., Afifah, N., Prasetya, E., & Hariri, M. R. (2022). Usnea in West Java: a potential source of bioactive secondary metabolites. *Berkala Penelitian Hayati,* 28(1), 26- 31. https://doi.org/10.23869/bphjbr.28.1.20224.

Jannah, M., Hariri, M. R., Kasiamdari, R. S., & Handayani, N. S. N. (2021). The use of DNA barcoding and phylogenetic analysis to improve identification of usnea spp. based on ITS rDNA. *Journal of Tropical Biodiversity and Biotechnology*, 6(1). https://doi.org/10.22146/JTBB.58635.

Jenkinson, C. B., Podgorny, A. R., Zhong, C., & Oakley, B. R. (2023). Computer-aided, resistance gene-guided genome mining for proteasome and HMG-CoA reductase inhibitors. *Journal of Industrial Microbiology and Biotechnology*, 50(1), kuad045.

Kalimuthu, K., & Prabakaran, R. (2013). Preliminary phytochemical screening and GC-MS analysis of methanol extract of Ceropegia pusilla. *International Journal of Research in Applied, Natural and Social Sciences*, 1(3), 49-58.

Kaneko, A., Tsukada, M., Fukai, M., Suzuki, T., Nishio, K., Miki, & Koyama, K. (2010). KDR kinase inhibitor isolated from the mushroom Boletopsis leucomelas. *Journal of natural products*, 73(5), 1002-1004.

Kang, S., Mansfield, M. A., Park, B., Geiser, D. M., Ivors, K. L., Coffey, M. D., Grünwald, N. J., Martin, F. N., Lévesque, C. A., & Blair, J. E. (2010). The promise and pitfalls of sequence-based identification of plant pathogenic fungi and oomycetes. *Phytopathology,* 100(8): 732–737.

Kartawinata, K. (2016). Diversitas ekosistem alami Indonesia: Ungkapan singkat dengan sajian foto dan gambar. Yayasan Pustaka Obor Indonesia.

Keeling, C.I., Henderson, H., Li, M., Yuen, M., Clark, E.L., Fraser, J.D., Huber, D.P.W., Liao, N.Y., Docking, T.R., Birol, I., Chan, S.K., Taylor, G.A., Palmquist, D., Jones, S.J.M., Bohlmann, J. (2012). Transcriptome and full-length cDNA resources for the mountain pine beetle, Dendroctonus ponderosae Hopkins, a major insect pest of pine forests. Insect Biochemistry and Molecular Biology. 42(8), 525-536, https://doi.org/10.1016/j.ibmb.2012.03.010

Kelly, L.J; Hollingsworth, P.M.; Coppins, B.J.; Ellis, C.J.; Harrold, P., Tosh, J., & Yahr, R. 2011. DNA Bacording of Lichenized Fungi Demonstrates High Identification Success in a Floristic Context. *New phytologist* (191):288-300.

Knight, A., Bannister, J. M., Ludwig, L. R., Malcolm, W. M., & Orlovich, D. A. (2013). Rediscovery of pycnidia in Thamnolia vermicularis: implications for chemotype occurrence and distribution. *The Lichenologist*, 45(3): 397–411.

Korabecna. 2007. The Variability in the Fungal Ribosomal DNA (ITS1, ITS2, and 5.8 S rRNA Gene): Its Biological Meaning and Application in Medical Mycology. *Applied Microbiology* (48): 301.

Kosecka, M., Kukwa, M., Jabłońska, A., Flakus, A., Rodriguez-Flakus, P., Ptach, Ł., & Guzow-Krzemińska, B. (2022). Phylogeny and ecology of *Trebouxia* photobionts from Bolivian lichens. *Frontiers in Microbiology*, 13, 779784.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Kovach. (2007). *Multi-variate Statistical Package.* Ver. 3.1. Published by Kovach Computing Services, Pentraeth, Wales, U.K. pp. 1-145.

Kress, W.J; Kenneth, J.; Wurdack; Elizabeth, A. Z., Lee, A. W., & Daniel, H. J. 2005. Use of DNA *Barcodes to identify Flowering Plants*. National Museum of Natural History, Smithsonian Institution. Washington.

Kroken, S., & Taylor, J. W. (2000). Phylogenetic species, reproductive mode, and specificity of the green alga *Trebouxia* forming lichens with the fungal genus *Letharia*. *Bryologist,* 645-660.

Kumar, P., Nayaka, S., Verma, T., Niranjan, A., & Upreti, D. K. (2025). Comparative analysis of antimicrobial, antioxidant activities and phytochemicals of Himalayan lichens. *Biomass Conversion and Biorefinery*, 15(4), 5361-5381.

Kurokawa, S. 1994. *Japanese species of Parmelia Ach*. (sens.str.), Parmeliaceae. J. Japan. 69:61 - 68.

Kusmoro, J., Noer, I. S., Jatnika, M. F., Permatasari, R. E., & Partasasmita, R. (2018). Lichen diversity in geothermal area of Kamojang, Bandung, West Java, Indonesia and its potential for medicines and dyes. *Biodiversitas*, 19(6), 2335–2343.

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: Journal of Biological Diversity*, 26(2).

Laguna-Defior, C., Pintado, A., Green, T. G. A., Blanquer, J. M., & Sancho, L. G. (2016). Distributional and ecophysiological study on the Antarctic lichens species pair *Usnea antarctica/Usnea aurantiaco-atra*. *Polar Biology*, 39(7), 1183–1195.

Lalthanpuii, P. B., Lalchhandama, K., & Lalfakzuala, R. (2022). Antioxidant and phytochemical analysis of selected lichen species from Mizoram, India. *Journal of Phytology*, 14, 31-35.

Lam-Tuong, V., Nguyen, P. T., Tran, T. H., & Le, X. T. (2025). Phenolic profile and antioxidant activity of *Usnea aciculifera. Mycobiology, 53*(1): 45–56.

Lawrence, E. 1995. *Henderssons Dictionary of Biological Terms 11th edition.* Longman Singapore Publisher (Pte) Ltd. Singapore.

Lichenologica, B., Festschrift, L., Nash, T. H., Cramer, I. I. I. J., & Verlagsbuchhandlung, B. (2011). *Taxonomical novelties in Parmeliaceae*. April, 211–224.

Lin, C. (2007). The lichen genus Usnea at Meifeng, Central Taiwan. *Coll. and Res*., 20, 1–7.

Loana, O. B., Johannesson, H., & Tibell, L. (2018*). Thamnolia tundrae* sp. nov., a cryptic species and putative glacial relict. *The Lichenologist*, 50(1), 59-75.

Lohwasser, U., Dittbrenner, A., Budahn, H., Marthe, F. and Börner, A. (2010.) Taxonomy of plant genetic resources – Use of morphological, molecular and phytochhemical data in order to verify existing classification. *Agriculture Conspectus Scientificus* 75 (4): 175-178.

Lücking, R., Nadel, M. R. A., Araujo, E., & Gerlach, A. (2020). Two decades of DNA barcoding in the genus *Usnea (Parmeliaceae): How useful and reliable is the ITS?*

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Plant and Fungal Systematics, 65(2), 303–357. https://doi.org/10.35535/pfsyst-2020-0025.

Lumbsch, H. T., & Leavitt, S. D. (2011). Goodbye morphology? A paradigm shift in the delimitation of species in lichenized fungi. *Fungal Diversity*, 50, 59-72.

Lv, X. C., Jiang, Y. J., Liu, J., Guo, W. L., Liu, Z. B., Zhang, W. & Ni, L. (2017). Evaluation of different PCR primers for *denaturing gradient gel electrophoresis* (DGGE) analysis of fungal community structure in traditional fermentation starters used for Hong Qu glutinous rice wine. *International journal of food microbiology*, 255, 58-65.

Mahieu, B., Qannari, E. M., & Jaillais, B. (2023). Extension and significance testing of *variable importance in projection* (VIP) indices in partial least squares regression and principal components analysis. *Chemometrics and Intelligent Laboratory Systems*, 242, 104986

Mangurana, W. O. I., Yusnaini, Y., & Sahidin, S. (2019). Analisis LC-MS/MS (*Liquid Crhomatogaph Mass Spectrometry*) dan Metabolit Sekunder serta Potensi Antibakteri Ekstrak n-*Heksana Spons Callyspongia aerizusa* yang diambil pada kondisi tutupan Terumbu Karang yang berbeda di Perairan Teluk Staring. *Jurnal biologi tropis*, 19(2), 131-141.

Manojlović, A., Nasir Khalid, A., Usman, M., Stefanović, O., Đukić, N., Manojlović, N., & Tomović, J. (2025). Phytochemical characterization and bioactivity evaluation of Himalayan lichen *Usnea lapponica Vain*.: antioxidant, antibacterial, and antibiofilm effects. *Natural Product Research*, 1-10.

Mark, K., Saag, L., Leavitt, S. D., Will-Wolf, S., Nelsen, M. P., Tõrra, T., Saag, A., Randlane, T., & Lumbsch, H. T. (2016). Evaluation of traditionally circumscribed species in the lichen-forming genus *Usnea*, section *Usnea (Parmeliaceae, Ascomycota)* using a six-locus dataset. *Organisms Diversity and Evolution*, 16(3), 497–524.

Marthinsen, G., Rui, S., & Timdal, E. (2019). OLICH: A reference library of DNA barcodes for Nordic lichens. *Biodiversity Data Journal*, 7, e36252.

Mattsson J.-E. & Lumbsch, H. T. 1989. The use of the species pair concept in lichen taxonomy. *Taxon* 38: 238–241.

Maulidiyah, Imran, Muntu, W., & Nurdin, M. (2016). Secondary metabolites identification from lichen *usnea longissima* ach.: Bioactivity test of antibacterial. *International Journal of Applied Chemistry,* 12(3), 347–357.

Medeiros, I. D., Ibáñez, A., Arnold, A. E., Hedderson, T. A., Miadlikowska, J., Flakus, A., & Lutzoni, F. (2024). Eco-phylogenetic study of *Trebouxia* in southern Africa reveals interbiome connectivity and potential endemism in a green algal lichen photobiont. *American Journal of Botany*, 111(12), e16441.

Medentsev, A.G., Arinbasarova, A.Y., Akimenko, V.K., 2005. Biosynthesis of naphthoquinone pigments by fungi of the genus *Fusarium*. Appl. *Biochem. Microbiol*. 41, 573–577. https://doi.org/10.1007/s10438-005-0091-8.

Michu, E. (2007). A short guide to phylogeny reconstruction. *Plant, Soil and Environment*, 53(10), 442–446. https://doi.org/10.17221/2194-pse

Molyneux, RJ; Lee, ST; Gardner, DR; Panter, KE; James, LF (2007). Phytochemicals: the good, the bad and the ugly?. *Phytochemistry*. 68 (22–24): 2973–85.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Moncada, B., Sipman, H. J. M., & Lücking, R. (2020). Testing DNA barcoding in *Usnea (Parmeliaceae*) in Colombia using the *internal transcribed spacer* (ITS*). Plant and Fungal Systematics*, 65(2), 358–385. https://doi.org/10.35535/pfsyst-2020-0026

Moncada, B., Sipman, H., & Lücking, R. (2020). Testing DNA barcoding in *Usnea (Parmeliaceae)* in Colombia using *the internal transcribed spacer* (ITS). *Plant and Fungal Systematics*, 65(2), 358-385.

Moritz, C., & Hillis, D. M. (1996). Molecular systematics: Context and controversies. Dalam D. M. Hillis, C. Moritz, & B. K. Mable (Eds.), *Molecular systematics* (2nd ed., pp. 1–13). Sinauer Associates

Motyka, J. (1947). *Lichenum generis Usnea studium monographicum*.

Muggia, L., Nelsen, M. P., Kirika, P. M., Barreno, E., Beck, A., Lindgren, H., Lumbsch, H. T., & Leavitt, S. D. (2020). Formally described species woefully underrepresent phylogenetic diversity in the common lichen photobiont genus *Trebouxia (Trebouxiophyceae, Chlorophyta)*: An impetus for developing an integrated taxonomy. *Molecular Phylogenetics and Evolution*, 149, 106821.

Murningsih, M., & Mafazaa, H. (2016). Jenis-Jenis Lichen Di Kampus Undip Semarang. *Bioma : Berkala Ilmiah Biologi*, 18(2), 20. https://doi.org/10.14710/bioma.18.2.20-29

Musharraf, S. G., Siddiqi, F., Ali, A., & Thadhani, V. M. (2017). Sensitive analysis of bioactive secondary metabolites in lichen species using liquid chromatography–mass spectrometry. *Journal of Pharmaceutical and Biomedical Analysis*, 146, 279-284.

Muvidha, A. (2020). *Lichen Di Jawa Timur*. hal 1-102. Tulungagung: Akademika Pustaka.

Nash, H.T. (2008). *Lichen Biology second edition*. Arizona: Cambridge University Press.

Negi, H. R. (2003). Lichens: A valuable bioresource for environmental monitoring and sustainable development. *Resonance*, 8(1), 51–58. https://doi.org/10.1007/bf02834450

Nei, M. & S. Kumar. (2000). *Molecular Evolution and Phylogenetics*. Oxford University Press: UK.

Nilsson, R. H., Ryberg, M., Abarenkov, K., Sjökvist, E., & Kristiansson, E. (2009). The ITS region as a target for characterization of fungal communities using emerging sequencing technologies. *FEMS Microbiology Lette*rs, 296(1), 97-101.

Noer, I. S., Ramlan, A., Subarnas, A., & Sutedja, E. (2013). Karakterisasi dan Kekerabatan Janggot Kai (Usnea spp.) di Priangan. *Indonesian Journal of Applied Sciences*, 3(2).

Noer, I.S., Maryawati, B., Maryani, L., Juanda, J., Manganti, A. 2015. Etnolichenology of Old Mens Beard (Usnea spp.) at Priangan. 2015. Prosiding of The 3rd International Conference on Biological Science 2013 (The 3rd ICBS-2013). ISSN 2413-0877 (2).

Nugroho, A.W., Widiyatno, Sutomo, Suryatmojo, H, Pujiono, E, Rusiani, Murwaningsih. (2025). Species Composition and Diversity of Trees Habitus Along an Elevational Gradient in Mount Merbabu, Indonesia. *International Journal of Design & Nature and Ecodynamics*, 20(4).

O'Brien, H. E., Parrent, J. L., Jackson, J. A., Moncalvo, J. M., & Vilgalys, R. (2005). Fungal community analysis by large-scale sequencing of environmental samples. *Applied and environmental microbiology,* 71(9), 5544-5550.

UNIVERSITAS
GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Ohmura, Y. (2002). Phylogenetic evaluation of infrageneric groups of the genus *Usnea* based on ITS regions in rDNA. *The Journal of the Hattori Botanical Laboratory*, 92, 231-243.

Ohmura, Y. (2012). A synopsis of the lichen genus *Usnea (Parmeliaceae, Ascomycota)* in Taiwan. *Memoirs of the National Museum of Nature and Science*, Tokyo, 48(48), 91–137.

Ohmura, Y., & Clerc, P. (2021). *Usnea esperantiana (Parmeliaceae, lichenized Ascomycota)* new to Asia. *Bulletin of the National Museum of Nature and Science,* Series B, 47, 13-20.

Ohmura, Yoshihito, & Kanda, H. (2004). Taxonomic status of section Neuropogon in the genus *Usnea* elucidated by morphological comparisons and ITS rDNA sequences. *Lichenologist*, 36(3–4), 217–225. https://doi.org/10.1017/S0024282904013830.

Ohmura, Yoshihito. (2001). Taxonomic study of the genus Usnea (lichenized ascomycetes) in Japan and Taiwan. *Journal of the Hattori Botanical Laboratory*, 96(90), 1–96.

Ohmura, Yoshihito. (2020). Presuming Morphological *Chemical and Molecular Phylogenetic Data*. 65(2), 265–271.

Oran, S., Sahin, S., Sahinturk, P., Ozturk, S., & Demir, C. (2016). Antioxidant and antimicrobial potential, and HPLC analysis of stictic and usnic acids of three *Usnea* species from Uludag mountain (Bursa, Turkey). *Iranian journal of pharmaceutical research: IJPR*, 15(2), 527.

Orock, E. A., Leavitt, S. D., Fonge, B. A., St. Clair, L. L., & Lumbsch, H. T. (2012). DNA-based identification of lichen-forming fungi: Can publicly available sequence databases aid in lichen diversity inventories of Mount Cameroon (West Africa) *Lichenologist*, 44(6), 833–839. https://doi.org/10.1017/S0024282912000424.

Osyczka, P., Latkowska, E., & Rola, K. (2021). Metabolic processes involved with sugar alcohol and secondary metabolite production in the hyperaccumulator lichen Diploschistes muscorum reveal its complex adaptation strategy against heavy-metal stress. *Fungal biology*, 125(12), 999-1008.

Pancoro, T. H. dan A. (2008). Kajian Filogenetika Molekuler dan Peranannya dalam Menyediakan Informasi Dasar untuk Meningkatkan Kualitas Sumber Genetik Anggrek Topik. *AgroBiogen*, 4(1), 35–40.

Pappalardo, P., Hemmi, J. M., Machida, R. J., Leray, M., Collins, A. G., & Osborn, K. J. (2025). Taxon-specific BLAST percent identity thresholds for identification of unknown sequences using metabarcoding. *Methods in Ecology and Evolution*, 16(10), 2380-2394.

Perez-Ortega, S., Ortiz-Álvarez, R., Allan Green, T. G., & de Los Ríos, A. (2012). Lichen myco-and photobiont diversity and their relationships at the edge of life (McMurdo Dry Valleys, Antarctica). *FEMS microbiology ecology*, 82(2), 429-448.

Permatananda, P. A. N. K., Pandit, I. G. S., & Udiyani, D. P. C. (2024). Antioxidant activity of Kintamani Siamese orange peel extract (*Citrus Nobilis*) with different polar solvent: an in vitro experimental study. *Multidisciplinary Science Journal*, 6(2).

UNIVERSITAS
GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Phi, Q. T., Nguyen, T. T., Le, T. H., & Nguyen, H. D. (2023). Phenolic compounds and biological activities of Usnea aurantiaco-atra. *Natural Product Research*, 37(12): 1985–1993.

Piercey-Normore, M.D. (2005). The lichen-forming *ascomycete Evernia mesomorpha* associates with multiple genotypes of *Trebouxia jamesii*. *New Phytologist* 169: 331-344

Pinokiyo, A., Singh, K. P., & Singh, J. S. (2008). Diversity and distribution of lichens in relation to altitude within a protected biodiversity hot spot, north-east India. *The Lichenologist,* 40(1), 47-62.

Poelt, J. (1970). Das Konzept der Artenpaare bei den Flechten. *Vorträge aus dem Gesamtgebiet der Botanik, Neue Folge, 4*, 187–198.

Poelt, J. (1972). Die taxonomische Behandlung von Artenpaaren bei den Flechten. *Botaniska Notiser, 125*, 77–81.

Popovici, V., Bucur, L., Schröder, V., Gille, E., & Tuchilus, C. (2022). Phytochemical characterization and biological activity of Usnea barbata extracts. *Plants*, 11(9): 1204.

Poquita-Du, R. C., Otte, J., Calchera, A., & Schmitt, I. (2024). Genome-wide comparisons reveal extensive divergence within the lichen photobiont genus, *Trebouxia*. *Genome biology and evolution*, 16(10), evae219.

Portella, G., Battistini, F., & Orozco, M. (2013). Understanding the connection between epigenetic DNA methylation and nucleosome positioning from computer simulations. *PLoS computational biology*, 9(11), e1003354.

Posada, D. 2009. *Selecting Models of Evolution. In The Phylogenetic Handbook 2nd* Edition (P. Lemey, M. Salemi, & A-M. Vandamme eds.). Cambridge University Pub.: UK.

Prateeksha, P., 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. RSC Advances, 6(26), 21672–21696.

Prokopiev, I. A., Poryadina, L. N., Konoreva, L. A., Chesnokov, S. V., & Shavarda, A. L. (2018). Variation in the composition of secondary metabolites in Flavocetraria lichens from Western Siberia. *Russian Journal of Ecology*, 49(5), 401-405.

Prokopiev, I., Chesnokov, S., Serebryakov, E., & Konoreva, L. (2022). Chemical variation in the *Arctoparmelia separata (Parmeliaceae, Lichenized Ascomycota)*. *Biochemical Systematics and Ecology,* 102, 104418.

Qi, H. Y., Jin, Y. P., & Shi, Y. P. (2009). A new depsidone from *Usnea diffracta*. *Chinese Chemical Letters*, 20(2), 187-189.

Rafat, A. (1994). *Lincoln University Digital Thesis Ecological and Biological Studies of New Zealand Lichens in the*.

Rafat, A. (2014). *Ecological and biological studies of New Zealand lichens in the genus Usnea* (Doctoral dissertation, Lincoln University). Lincoln University Research Archive.

Randlane, T., Tõrra, T., Saag, A., & Saag, L. (2009). Key to European *Usnea* species. *Bibliotheca Lichenologica,* 100(c), 419–462.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Ranković, B., & Kosanić, M. (2015). Lichens as a potential source of bioactive secondary metabolites. In B. Ranković (Ed.), *Lichen Secondary Metabolites: Bioactive Properties and Pharmaceutical Potential* (pp. 1–26). Springer International Publishing.Potential, June, 1–202. https://doi.org/10.1007/978-3-319-13374-4

Ranković, B., & Kosanić, M. (2019). Lichens as a potential source of bioactive secondary metabolites. *Lichen secondary metabolites: bioactive properties and pharmaceutical potential*, 1-29.

Rawat, M. S. M., Shukla, V., Negi, S., & Pant, G. (2006). Chemical study on Garhwal Himalayan lichen: *Usnea emidotteries*. *Indian journal of chemistry. Sect. B: Organic chemistry, including medical chemistry,* 45(11), 2566-2570.

Richardson, D. H. S. (1992). Fungal-Plant Interactions.By S. Isaac London: Chapman &Hall. 1992. Pp. 418, 122 figures. *The Lichenologis*t, 24(3), 313–313.

Rudi, K. (2009). Environmental shaping of ribosomal RNA nucleotide composition. *Microbial ecology*, 57(3), 469-477.

Saini, N., Anmol, A., Kumar, S., Wani, A. W., Bakshi, M., & Dhiman, Z. (2024). Exploring phenolic compounds as natural stress alleviators in plants-a comprehensive review. *Physiological and Molecular Plant Pathology*, 133, 102383.

Salgado, F., Albornoz, L., Cortéz, C., Stashenko, E., Urrea-Vallejo, K., Nagles, E., Galicia-Virviescas, C., Cornejo, A., Ardiles, A., Simirgiotis, M., García-Beltrán, O., & Areche, C. (2018). Secondary metabolite profiling of species of the genus *usnea* by UHPLC-ESI-OT- MS-MS. *Molecules*, 23(1), 1–16. https://doi.org/10.3390/molecules23010054

Santiago, KAA; sangvichien; Boopragob, K; Cruz, T. E. E. (2013). Secondary metabolic profiling and antibacterial activities of different species of *Usnea* collected in Northern Philippines. *Mycosphere*, 4 (2).

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

Sedrpoushan, A., Haghi, H., & Sohrabi, M. (2022). A new secondary metabolite profiling of the lichen Diploschistes diacapsis using liquid chromatography electrospray ionization tandem mass spectrometry. *Inorganic Chemistry Communications,* 145(March), 110006. https://doi.org/10.1016/j.inoche.2022.110006

Seidl, B., Rehak, K., Bueschl, C., Parich, A., Buathong, R., Wolf, B.,& Schuhmacher, R. (2022). Gramiketides, Novel Polyketide Derivatives of Fusarium graminearum, Are Produced during the Infection of Wheat. *Journal of Fungi,* 8(10), 1030.

Sérusiaux, E., Diederich, P., Ertz, D., & van den Boom, P. (2009). New or interesting lichens and lichenicolous fungi from Belgium, Luxembourg and northern France. *Bulletin de la Société des Naturalistes Luxembourgeois, 110*, 75–93.

Seymour, F. A., Crittenden, P. D., Wirtz, N., Øvstedal, D. O., Dyer, P. S., & Lumbsch, H. T. (2007). Phylogenetic and morphological analysis of Antarctic lichen-forming *Usnea* species in the group Neuropogon. *Antarctic Science,* 19(1), 71–82.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Sharuddin, S., & Muda, N. (2015). Performance Comparison between Bootstrap and Multiscale Bootstrap for Assessing Phylogenetic Tree for RNA polymerase. *Sains Malaysiana*, 44(11), 1643-1651.

Shrestha, G., & St Clair, L. L. (2014). *Lichen phenolics: Environmental effects*. In Polyphenols in Plants (pp. 53-62). Academic Press.

Shukla, P. (2014). Lichen genus *Usnea (Parmeliaceae, Ascomycota)* in Uttarakhand, India. *Current Research in Environmental & Applied Mycology*, 4(2), 188–201.

Shukla, P., Upreti, D. k., & Tewari, L. M. (2015). Secondary metabolite variability in lichen genus *Usnea* in India: A potential source for bioprospection. *Journal of Environmental Science and Technology,* 2(4), 44–55. http://www.gjestenv.com.

Singh, G. (2010). *Plant Systematics: An Integrated Approach* (3rd ed.). CRC Press

Singh, G. (2019). Plant systematics: an integrated approach. CRC Press.

Singhal, S., Leaché, A. D., Fujita, M. K., Cadena, C. D., & Zapata, F. (2025). A genomic perspective on species delimitation. *Annual Review of Ecology, Evolution, and Systematics*, 56.

Sinha, D., Borkataky, M., Chowardhara, B., & Nath, R. (2024). *Taxonomy of lichen*. Dalam A. K. Das, A. Sharma, D. Kathuria, M. J. Ansari, & G. Bhardwaj (Eds.), *Chemistry, Biology and Pharmacology of Lichen*. Wiley.

Sneath, P. H. A., & Sokal, R. R. (1973). *Numerical taxonomy: The principles and practice of numerical classification*. San Francisco: W.H. Freeman and Company

Solárová, Z., Liskova, A., Samec, M., Kubatka, P., Büsselberg, D., & Solár, P. (2020). Anticancer potential of lichens' secondary metabolites. *Biomolecules*, 10(1), 87.

Solhaug KA, Lind M, Nybakken L et al (2009) Possible functional roles of cortical depsides and medullary depsidones in the foliose lichen Hypogymnia physodes. *Flora* 204:40–48.

Solhaug, K. A., Gauslaa, Y., Nybakken, L., & Bilger, W. (2003). UV-induction of sun-screening pigments in lichens. *New Phytologist, 158*(1), 91–100.

Stevens, G. N. (1991). The tropical Pacific species of *Usnea* and *Ramalina* and their relationship to species in other parts of the world. In D. J. Galloway (Ed.), *Tropical Lichens: Their Systematics, Conservation, and Ecology* (pp. 47–67). Oxford University Press. https://doi.org/10.1093/oso/9780198577201.003.0004

Stevens, G. N. (1999). *A revision of the lichen family Usneaceae in Australia*. Bibliotheca Lichenologica, 72, 1–128.

Stevens, P. F. (2012). *Angiosperm Phylogeny Website*. Version 12. Missouri Botanical Garden. http://www.mobot.org/MOBOT/research/APweb/

Sugimoto, M., & Ohmura, Y. (2023). Lichens from Mugikusa Pass and the adjacent areas in Kita-Yatsugatake Mts, central Japan. *Bulletin of the National Museum of Nature and Science. Series B, Botany*, 49(1), 1-16.

Supriati, R., Wibowo, R. H., Lestari, D. F., & Maryana, L. (2023). Bioaktivitas *Usnea barbata* (L.) FH Wigg sebagai Insektisida Nabati *Coptotermes curvignathus* (*Holmgren*). Indonesian *Journal of Agricultural Sciences/Jurnal Ilmu Pertanian Indonesia*, 28(3).

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Susilawati, P. R. (2017). Fruticose dan Foliose Lichen di Bukit Bibi, Taman Nasional Gunung Merapi. *Jurnal Penelitian*, 21(1).

Swinscow, T. D. V., & Krog, H. (1978). Pendulous species of *Usnea* in East Africa. Norwegian *Journal of Botany.*

Tariq, A., & Ahmed, A. (2024). Plant phenolics production: a strategy for biotic stress management. In Plant phenolics in biotic stress management (pp. 441-454). *Singapore: Springer Nature Singapore*

Tehler, A. 1982. The species pair concept in lichenology. *Taxon* 31: 708–714.

Temu, S. G., Clerc, P., Tibell, L., Tibuhwa, D. D., & Tibell, S. (2019). Phylogeny of the subgenus Eumitria in Tanzania. *Mycology*, 10(4), 250–260.

Terzic, M., Fayez, S., Fahmy, N. M., Eldahshan, O. A., Uba, A. I., Ponniya, S. K. M., & Zengin, G. (2024). Chemical characterization of three different extracts obtained from *Chelidonium majus* L.(Greater celandine) with insights into their in vitro, in silico and network pharmacological properties. *Fitoterapia*, 174, 105835.

Thell, A., Crespo, A., Divakar, P. K., Kärnefelt, I., Leavitt, S. D., Lumbsch, H. T., & Seaward, M. R. D. (2012). A review of the lichen famili *Parmeliaceae* - history, phylogeny and current taxonomy. *Nordic Journal of Botany*, 30(6), 641–664. https://doi.org/10.1111/j.1756-1051.2012.00008.x.

Thell, A., Kärnefelt, I., & Seaward, M. R. D. (2018). Splitting or synonymizing – genus concept and taxonomy exemplified by the *Parmeliaceae* in the Nordic region. *Graphis Scripta*, 30(6), 130–137.

Timbreza, L. P., Delos Reyes, J. L., Flores, C. H. C., Perez, R. J. L. A., Stockel, M. A. S., & Santiago, K. A. A. (2017). *Antibacterial activities of the lichen Ramalina and Usnea collected from Mt. Banoi, Batangas and Dahilayan, Bukidnon, against multidrug-resistant bacteria*. *Austrian Journal of Mycology, 26*, 27–42.

Tõrra, T., & Randlane, T. (2007). The lichen genus *Usnea (lichenized Ascomycetes, Parmeliaceae)* in Estonia with a key to the species in the Baltic countries. *Lichenologist*, 39(5), 415–438.

Truong, C., & Clerc, P. (2012). The lichen genus *Usnea (Parmeliaceae)* in tropical South America: Species with a pigmented medulla, reacting C+ yellow. *Lichenologist*, 44(5), 625–637. https://doi.org/10.1017/S0024282912000400.

Truong, C., & Clerc, P. (2013). Eumitrioid *Usnea s*pecies (*Parmeliaceae, lichenized Ascomycota*) in tropical South America and the Galapagos. *Lichenologist*, 45(3), 383–395. https://doi.org/10.1017/S0024282912000904.

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. *The Bryologist*, 114(3), 477-503.

Ullah, S., Shah, S. A. A., Muhammad, N., Khan, A., & Ullah, F. (2019). Chemical constituents and biological activities of *Usnea longissima*. *Journal of Asian Natural Products Research,* 21(10): 987–995.

Umoh, O. T. (2020). Chemotaxonomy: The role of phytochemicals in chemotaxonomic delineation of taxa. *Asian Plant Research Journal, 5*(1), 43–52.

UNIVERSITAS GADJAH MADA
BIOSISTEMATIKA KAYU ANGIN (Usnea spp.) DI PULAU JAWA BERDASARKAN KARAKTER MORFOLOGIS, FITOKIMIA, DAN MOLEKULER
Miftahul Jannah, Prof. Rina Sri Kasiamdari, S.Si., Ph.D.; Prof. Dr. Ratna Susandarini, M.Sc.; Prof. Dr. Laurentius Har
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

Verma, N., & Behera, B. C. (2014). Future directions in the study of pharmaceutical potential of lichens. *In Lichen secondary metabolites: bioactive properties and pharmaceutical potential* (pp. 237-260). Cham: Springer International Publishing.

Větrovský, T., & Baldrian, P. (2013). Analysis of soil fungal communities by amplicon pyrosequencing: current approaches to data analysis and the introduction of the pipeline SEED. *Biology and Fertility of Soils*, 49, 1027-1037.

Vilgalys, R. (2003). Taxonomic misidentification in public DNA databases. *New Phytologist*, 160(1), 4-5.

Vondrák, J., Svoboda, S., Kosnar, J., Malicek, J., Soun, J., Frolov, I.,& Palice, Z. (2023). Martin7: a reference database of DNA barcodes for European epiphytic lichens and its taxonomic implications. *Preslia*, 95(3), 311-345.

Walker, F. J. (1985). The lichen genus *Usnea* subgenus *Usnea* in Australasia. Xu, M., Fernández-Mendoza, F., Beck, A., & Lumbsch, H. T. (2020). *A revision of Trebouxia (Trebouxiophyceae, Chlorophyta): Recognition of a new photobiont lineage based on multilocus phylogeny. Phycologia.*

White, T.J.; Bruns, S.L.; & Taylor,1990. *Amplification and Direct Sequencing of Fungal Ribosomal RNA Genes For Phylogenetic.* Academic press.Inc.

Won, H., & Renner, S. S. (2005). The internal transcribed spacer of nuclear ribosomal DNA in the gymnosperm Gnetum. *Molecular Phylogenetics and Evolution*, 36(3), 581–597. https://doi.org/10.1016/j.ympev.2005.03.011

Xin, C., & Yang, Q. (2020). The first complete chloroplast genome sequence of *Vicia ramuliflora (Fabaceae)*. *Mitochondrial DNA Part B*, 5(1), 410-411.

Xu, M., Heidmarsson, S., Thorsteinsdottir, M., Eiriksson, F. F., Omarsdottir, S., & Olafsdottir, E. S. (2017). DNA barcoding and LC-MS metabolite profiling of the lichen-forming genus Melanelia: Specimen identification and discrimination focusing on Icelandic taxa. *PloS One,* 12(5), e0178012.

Yang, R. H., Su, J. H., Shang, J. J., Wu, Y. Y., Li, Y., Bao, D. P., & Yao, Y. J. (2018). Evaluation of the ribosomal DNA *internal transcribed spacer* (ITS), specifically ITS1 and ITS2, for the analysis of fungal diversity by deep sequencing. *PLoS ONE*, 13(10), 1–17. https://doi.org/10.1371/journal.pone.0206428.

Zahlbruckner, A., & Mattick, F. (1956). *Flechtenflora von Java* (Teil 2). Willdenowia, 1, 433–528.

Zhao, Y., Wang, M., & Xu, B. (2021). A comprehensive review on secondary metabolites and health-promoting effects of edible lichen. *Journal of Functional Foods,* 80(August 2020), 104283.