

DAFTAR PUSTAKA

- Ade, A., N. Hirmarizqi, E. S. R. Fembriyanto, N. Hidayati, dan R. Hertati. 2019. Identifikasi lebah kelulut asal bangka dan pendataan jenis tumbuhan penghasil resin bahan baku pembuatan propolis. *Ekotonia Jurnal Penelitian Biologi Botani Zoologi Dan Mikrobiologi*, 4(2), 37–42.
- Adnan, W. N. A. W. M., S. Jamian, N. A. Adam, N. A. Shilan, M. S. Tan, S. A. Samsudin, and C. L. Puan 2021. Foraging activities of stingless bees, *Geniotrigona thoracica* and *Heterotrigona itama* (Apidae: Meliponini) in relation to wet and dry seasons in selangor, malaysia. *industry and higher education*, 26(4), 153–160.
- Afifah, S., S., A. Kadarsah, dan S. G. Sari. 2025. Analisis kualitas fisikokimia madu lebah kelulut (*Heterotrigona itama*) pada tiga lokasi meliponikultur di Kelurahan Sungai Tiung, Kota Banjarbaru. *Jurnal Natural Scientiae*, 5(2), 55–64.
- Agussalim, A., N. Umami, Nurliyani, and A. Agus. 2021. The physicochemical composition of honey from Indonesian stingless bee (*Tetragonula laeviceps*). *Biodiversitas*, 22(8), 3257–3263.
- Akbar, A. F., N. Gesriantuti, N. Herlina, N. Starif, and S. F. Tas'ad. 2025. Pollen foraging activity of stingless bee (*Heterotrigona itama*) in managed colonies at the Adat Imbo Putui Forest (AIPF), Kampar Regency. *Jurnal Biologi Papua*, 17 (2), 103–111.
- Alex, S. 2012. *Keajaiban Propolis Dalam Mengobati Penyakit*. Pustaka Baru Press: Yogyakarta.
- Al-Hatamleh, M. A. I., J. C. Boer, K. Wilson, M. Plebanski, R. Mohamud, and M. Z. Mustafa. 2020. Antioxidant-based medicinal properties of stingless bee products: recent progress and future directions. *Biomolecules*, 10(6).
- Alwi, M. 2025. Analisis profil fisikokimia madu lebah galo-galo (*Heterotrigona itama*) asal kota Padang. Skripsi. Universitas Andalas: Padang,
- Apriani D., Gusnedi dan Y. Darvina. 2013. Studi tentang nilai viskositas madu hutan dari beberapa daerah di Sumatera Barat untuk mengetahui kualitas madu. *Pillar of physics*, 2(1), 91-98.

- Atmowidi, T., T. S. Prawasti, P. Rianti, F. A. Prasajo, dan N. B. Pradipta. 2022. Stingless bees pollination increases fruit formation of strawberry (*Fragaria x annanassa Duch*) and melon (*Cucumis melo L.*). Tropical Life Sciences Research, 33(1), 43–54.
- Baroyi, A. H. M., Y. A. Yusof, and N. L. Chin. 2019. A novel method based on passive diffusion that reduces the moisture content of stingless bee (*Heterotrigona itama*) honey. Journal of Food Process Engineering, 42, e13221.
- Berriel, V. 2018. Carbon stable-isotope and physicochemical data as a possible tool to differentiate between honey-production environments in Uruguay. Foods, 7 (6).
- Bilandžić, N., I. T. Gajger, M. Kosanović, B. Čalopek, M. Sedak, B. Solomun Kolanović, I. Varenina, Đ. B. Luburić, I. Varga, and M. Đokić. 2017. Essential and toxic element concentrations in monofloral honeys from southern Croatia. Food Chemistry, 234, 245–253.
- Bodor, Z., C. Benedek, Á. Urbin, D. Szabó, and L. Sipos. 2021. Colour of honey: can we trust the pfund scale? an alternative graphical tool covering the whole visible spectra. LWT, 149, 111859.
- Bogdanov, S., V. Kilchenmann, K. Seiler, H. Pfeifferli, T. Frey, B. Roux, P. Wenk, and J. Noser. 2004. Residues of para-dichlorobenzene in honey and beeswax. Journal of Apicultural Research, 43(1), 14–16.
- Bueno, F. G. B., L. Kendall, D. A. Alves, M. L. Tamara, T. Heard, T. Latty, and R. Gloag. 2023. Stingless bee floral visitation in the global tropics and subtropics. Global Ecology and Conservation, 43, e02454.
- Chuttong, B., Y. Chanbang, K. Sringarm, dan M. Burgett. 2016. Physicochemical profiles of stingless bee (*Apidae: Meliponini*) honey from southeast asia (Thailand). Food Chemistry, 192, 149–155.
- Codex Alimentarius Commission. 2001. Revised Codex Standard for Honey. Codex Alimentarius Commission FAO/WHO: Rome.
- Da Silva, P. M., C. Gauche, L. V. Gonzaga, A. C. O. Costa, dan R. Fett. 2016. Honey: chemical composition, stability and authenticity. Food Chemistry, 196, 309–323.
- Danggi, E. 2023. Analisis kualitas madu produksi kelompok peternak lebah *Trigona* di desa Watabenua kabupaten Konawe selatan. Jurnal Sultra Sains, 5(1), 20–28.

- Das, T. S. T., dan G. M. 2015. Quality evaluation of honey from stingless bee (*Trigona sp.*) reared by Garo tribes in west Garo hills of Meghalaya. *Journal of Krishi Vigyan*. 4(1), 91–94.
- Do Nascimento, D. L., dan N. F. Santos. 2012. Extreme effects of season on the foraging activities and colony productivity of a stingless bee (*Melipona asilvai* Moure, 1971) in northeast Brazil. *Psyche*, 2012, 267361.
- Dominguez, M., and M. Centurión. 2015. Application of digital images to determine color in honey samples from Argentina. *Microchemical Journal*, 118, 110–114.
- Dos Santos, A. C., M. R. Faita, L. V. Gonzaga, and A. C. O. Costa. 2025. Evaluating maturity indicators in stingless bee honey: The role of soluble solids over pot condition in harvesting standards. *Journal of Food Composition and Analysis*, 137, 106869.
- Dos Santos, C. F., K. Devkota, B. Blochtein, and E. A. B. Almeida. 2026. Thermal patterns in stingless bee colonies. *The Science of Nature*, 113(2), 1–9.
- Dzugan, M., M. Tomczyk, P. Sowa, and D. Grabek-Lejko. 2018. Antioxidant activity as biomarker of honey variety. *Molecules*, 23(8), 1–14.
- Enko, J., and A. Gliszczynska-Swiglo. 2015. Influence of the interactions between tea (*Camellia sinensis*) extracts and ascorbic acid on their antioxidant activity: Analysis with interaction indexes and isobolograms. *Food Additives and Contaminants Part A: Chemistry, Analysis, Control, Exposure and Risk Assessment*, 32(8), 1234–1242.
- Erwan, Habiburrohman, I. K. G. Wiryawan, M. Muhsinin, B. Supeno, and Agussalim. 2023. Comparison of productivity from three stingless bees: *Tetragonula sapiens*, *T. clypearis* and *T. biroi* managed under same feed sources for meliponiculture. *Biodiversitas*, 24(5), 2988–2994.
- Fletcher, M. T., N. L. Hungerford, D. Webber, M. Carpinelli de Jesus, J. Zhang, I. S. J. Stone, J. T. Blanchfield, and N. Zawawi. 2020. Stingless bee honey, a novel source of trehalulose: A biologically active disaccharide with health benefits. *Scientific Reports*, 10(1), 1–8.
- Gadge, A. S., D. V. Shirsat, P. S. Soumia, C. L. Pote, M. Pushpalatha, T. R. Pandit, R. Dutta, S. Kumar, S. V. Ramesh, V. Mahajan, and V. Karuppaiah. 2023. Physiochemical, biological, and therapeutic uses of stingless bee honey. *Frontiers in Sustainable Food Systems*, 7.

- Gajda, A., B. Lewandowski, P. Rujna, J. K. Banach, R. Pietrzak-Fiećko, and E. Tkacz. 2026. Immature honey as a quality challenge in global apicultural production. *Foods*, 15(12).
- Gebreyes, B. G., T. A. Teka, Y. B. Tola, M. Tamiru, and N. Kiatoko. 2025. The physicochemical properties, biochemical makeup, and health benefits of honey produced from stingless bees (*Apidae: Meliponini*). *Journal of Food Quality*, 2025(1).
- Gebbru, N., and H. Gebretsadik. 2015. Assessment of honey bee flora in eastern zone of tigray, north. *Journal of Biology, Agriculture and Healthcare*, 5(1), 53-57.
- Ghazali, M., N. S., Y. Yusof, H. M. Ghazali, N. Chin, S. Othman, Y. Manaf, L. S. Chang, and S. A. H. M. Baroyi. 2020. Effect of surface area of clay pots on physicochemical and microbiological properties of stingless bee (*Geniotrigona thoracica*) honey. *Food Bioscience*, 40, 100839.
- Golub, O. V., G. P. Chekryga, and O. K. Motovilov. 2020. Effect of pollen grains on the color of honey from *Melilotus officinalis* (L.) Pall. *Food Processing: Techniques and Technology*, 50(4), 660–669.
- Hakim, S. S., R. S. Wahyuningtyas, B. Rahmanto, dan W. Halwany. 2021. Sifat fisikokimia dan kandungan mikronutrien pada madu kelulut (*Heterotrigona itama*) dengan warna berbeda. *Jurnal Penelitian Hasil Hutan*, 39(1), 1–12.
- Hanifa, R., dan R. Zainul. 2025. Analisis kadar sukrosa dan gula pereduksi pada madu *Trigona* (stingless bee honey) menggunakan metode Luff Schoorl. *Jurnal Pendidikan Kimia, Fisika dan Biologi*, 1(6), 20–33.
- Harjanto, S., M. Mujiyanto, Arbainsyah, dan A. Ramlan. 2020. Budidaya Lebah Madu Kelulut Sebagai Alternatif Mata Pencarian Masyarakat. Yogyakarta.
- Hassan, M. K. N. A., R. K. R. Ibrahim, D. Maisarah, Z. Zakaria, N. Ihsan, and T. A. Fauziah. 2021. Profiling pH and moisture content of stingless bee honey in closed and opened cerumen honey pots. *Journal of Physics: Conference Series*, 1892(1).
- Hidyanisa, D., I. M. Budiarsa, A. Ashari, M. Trianto, M. Nurdin, dan Y. Windarsih. 2021. Analisis filogenetik lebah madu endemik Sulawesi *Apis nigrocincta* Smith, 1860 berdasarkan gen 16S rRNA. *Bioscientist: Jurnal Ilmiah Biologi*, 13(1), 542.
- Hrncir, M., S. Jarau, and F. G. Barth. 2016. Stingless bees (*Meliponini*): Senses and behavior. *Journal of Comparative Physiology A*, 202(9–10), 597–601.

- Hungerford, N. L., H. S. A. Yates, T. J. Smith, and M. T. Fletcher. 2023. Organic acid profiles of Australian stingless bee honey samples determined by ion chromatography. *Journal of Food Composition and Analysis*, 122, 105466.
- Hunter Lab. 2008. Measuring Color Using Hunter L, a, b versus CIE 1976 La*b**. Hunter Lab.
- Isla, M. I., A. Craig, R. Ordoñez, C. Zampini, J. Sayago, E. Bedascarrasbure, A. Alvarez, V. Salomón, and L. Maldonado. 2011. Physico chemical and bioactive properties of honeys from Northwestern Argentina. *LWT–Food Science and Technology*, 44(9), 1922–1930.
- Ismail, N. F., M. Maulidiani, S. Omar, M. F. Zulkifli, M. N. F. M. Radzi, W. Men, G. Yew, N. Ismail, A. Z. Jusoh, S. Roowi, R. Rudiyanto, and W. I. W. Ismail. 2021. Classification of stingless bee honey based on species, dehumidification process and geographical origins using physicochemical and ATR-FTIR chemometric approach. *Journal of Food Composition and Analysis*, 104, 104126.
- Kadarsah, A., A. P. Putra, A. Nurliani, E. Suhartono, and F. S. Ibrahim. 2024. Morphological characteristics and nest structure of stingless bee (*Heterotrigona itama*) from different meliponiculture practices. *Biosaintifika*, 16(1), 49–62.
- Kathuria, D., Hamid, S. Gautam, and A. Thakur. 2023. Maillard reaction in different food products: Effect on product quality, human health and mitigation strategies. *Food Control*, 153, 109911.
- Kelly, N., M. S. N. Farisya, T. K. Kumara, and P. Marcela. 2014. Species diversity and external nest characteristics of stingless bees in meliponiculture. *Pertanika Journal of Tropical Agricultural Science*, 37(3), 293–298.
- Khalil, M. I., M. Moniruzzaman, L. Boukraâ, M. Benhanifia, M. A. Islam, M. N. Islam, S. A. Sulaiman, and S. H. Gan. 2012. Physicochemical and antioxidant properties of Algerian honey. *Molecules*, 17(9), 11199–11215.
- Khikmanisa, T., D. Yoza, dan Pebriandi. 2024. Karakteristik habitat koloni lebah kelulut di desa Baturijal Hulu kecamatan Peranap kabupaten Indragiri Hulu, Riau. *Jurnal Silvikultur Tropika*, 15(3), 185–193.
- Kwapong P., K. K. Aidoo, R. Combey, and A. Karikari. 2010. Stingless Bees: Importance, Management and Utilisation. A Training Manual for Stingless Bee Keeping. Unimax Macmillan Ltd.: Accra.

- Lawson, D. A., and S. A. Rands. 2019. The effects of rainfall on plant–pollinator interactions. *Arthropod-Plant Interactions*, 13(4), 561–569.
- Lichtenberg, E. M., V. L. Imperatriz-Fonseca, dan J. C. Nieh. 2010. Behavioral suites mediate group-level foraging dynamics in communities of tropical stingless bees. *Insectes Sociaux*, 57(1), 105–113.
- Malaysian Standard. 2017. MS 2683:2017. Kelulut (stingless bee) honey - Specification, Malaysia.
- Michener C. D. 2007. *The Bees of the World*. 2nd ed. The Johns Hopkins University Press: Baltimore.
- Mitchell, D. 2019. Nectar, humidity, honey bees (*Apis mellifera*) and *Varroa* in summer: a theoretical thermofluid analysis of the fate of water vapour from honey ripening and its implications on the control of *Varroa destructor*. *Journal of the Royal Society Interface*, 16(156).
- Nanda, P. B. 2015. Perbandingan kandungan kadar air, glukosa dan fruktosa pada madu karet dan madu sonokeling. Sarjana thesis, Universitas Brawijaya.
- Olas, B. 2020. Honey and its phenolic compounds as an effective natural medicine for cardiovascular diseases in humans? *Nutrients*, 12(2), 1–14.
- Pribadi, A. 2021. Perbandingan uji budi daya lebah jenis *Heterotrigona itama* pada empat tipe vegetasi. *Jurnal Penelitian Hutan Tanaman*, 18(2), 93–108.
- Pribadi, A., dan M. D. E. Wiratmoko. 2023. Karakteristik fisikokimia madu *Heterotrigona itama* asal Provinsi Riau. *Wahana Forestra: Jurnal Kehutanan*, 18(2), 13–28.
- Putra, R. G., A. T. A. Salim, A. Aminudin, dan N. Romandoni. 2021. Terapan IPTEK pada pengolahan dan peningkatan produktivitas lahan di masyarakat Pacitan untuk budidaya lebah klanceng. *Jurnal Pengabdian Magister Pendidikan IPA*, 4(4), 167–174.
- Rababah, T., M. Al-Omoush, S. Brewer, M. Alhamad, W. Yang, M. Alrababah, A. Al-Ghzawi, M. Aludatt, K. Ereifej, F. Alsheyab, R. Esoh, and A. Almajwal. 2014. Total phenol, antioxidant activity, flavonoids, anthocyanins and color of honey as affected by floral origin found in the arid and semiarid Mediterranean areas. *Journal of Food Processing and Preservation*, 38.

- Rahimah, J. 2026. Hubungan suhu, kelembapan dan intensitas cahaya terhadap produksi madu dan aktivitas keluar masuk sarang lebah pekerja *Heterotrigona itama*. Skripsi. Universitas Andalas: Padang.
- Rao, P. V., K. T. Krishnan, N. Salleh, and S. H. Gan. 2016. Biological and therapeutic effects of honey produced by honey bees and stingless bees: A comparative review. *Revista Brasileira de Farmacognosia*, 26(5), 657–664.
- Rasmussen, C., J. C. Thomas, and M. S. Engel. 2017. A new genus of Eastern Hemisphere stingless bees (*Hymenoptera: Apidae*), with a key to the supraspecific groups of Indomalayan and Australasian *Meliponini*. *American Museum Novitates*, 3888.
- Roubik, D. W. 2006. Review article stingless bee nesting biology. *Apidologie*, 37, 124–143.
- Ruoff. 2006. Graphene-based composite materials. *Nature*, 442(7100), 282–286.
- Sagaf, M., S. Ahmad, dan K. Nuzulia. 2022. Analisa pengurangan kadar air madu klanceng menggunakan metode dehumidifikasi. *Jurnal Disprotek*, 13(1), 21–27.
- Samsudin, S. F., M. R. Mamat, and I. R. Hazmi. 2018. Taxonomic study on selected species of stingless bee (*Hymenoptera: Apidae: Meliponini*) in Peninsular Malaysia. *Serangga*, 23(2), 203–258.
- Sanjaya, V., D. Astiani, dan L. Sisillia. 2019. Studi habitat dan sumber pakan lebah kelulut di kawasan cagar alam gunung Nyiut desa Pisak kabupaten Bengkayang. *Hutan Lestari*, 7(2), 786–798.
- Seprido, S., dan N. Hadi. 2024. Adaptation and production of *Heterotrigona itama* from natural colonies in Kuantan Singingi. *Jurnal Agronomi Tanaman Tropika (Juatika)*, 6(1), 47–52.
- Shamsudin, S., J. Selamat, M. Sanny, S. B. Abd. Razak, N. N. Jambari, Z. Mian, and A. Khatib. 2019. Influence of origins and bee species on physicochemical, antioxidant properties and botanical discrimination of stingless bee honey. *International Journal of Food Properties*, 22(1), 238–263.
- Shamsudin, S., J. Selamat, M. Sanny, A. R. Shamsul Bahari, N. N. Jambari, and A. Khatib. 2019. A comparative characterization of physicochemical and antioxidants properties of processed *Heterotrigona itama* honey from different origins and classification by chemometrics analysis. *Molecules*, 24(21), 1–20.

- Sharin, S. N., M. S. Abdullah Sani, N. K. Kassim, M. H. Yuswan, A. Abd Aziz, M. A. Jaafar, and A. M. Hashim. 2024. Impact of harvesting seasons on physicochemical properties and volatile compound profiles of Malaysian stingless bee honey analysed using chemometrics and support vector machine. *Food Chemistry*, 444, 138429.
- Sihombing, D. T. H. 2005. *Ilmu Ternak Lebah Madu*. Gadjah Mada University Press: Yogyakarta.
- Standar Nasional Indonesia. 2024. SNI 8664:2024. Madu, Jakarta.
- Souza, B., D. Roubik, O. Barth, T. Heard, E. Enríquez, C. Carvalho, J. Villas-Bôas, L. Marchini, J. Locatelli, L. Persano-Oddo, L. Almeida-Muradian, S. F. Bogdanov, and P. Vit. 2006. Composition of stingless bee honey: Setting quality standards. *Interciencia*, 31(12).
- Suhri, A. G. M. I., and I. Bahar. 2023. Water content of stingless bee honey varies by season. *Jurnal Biologi Tropis*, 23(2), 16–22.
- Sujanto, I. S. R., N. S. Ramly, J. Y. H. Tang, A. A. Ghani, N. Alias, S. Mohamed, and N. Ngah. 2022. Influence of spatial variation on the physicochemical properties and mineral content of stingless bee honey (*Heterotrigona itama*) in Terengganu, Malaysia. *Asian Journal of Agriculture and Biology*, 2022(4), 1–10.
- Suranto A. 2007. *Terapi Madu*. Penebar Swadaya: Jakarta.
- Syafrizal, R. Ramadhan, I. W. Kusuma, S. Egra, K. Shimizu, M. Kanzaki, and E. T. Arung. 2020. Diversity and honey properties of stingless bees from meliponiculture in East and North Kalimantan, Indonesia. *Biodiversitas*, 21(10), 4623–4630.
- Szabó, A., M. Melchionda, G. Nastasi, M. L. Woods, S. Campo, R. Perris, and R. Mayor. 2016. In vivo confinement promotes collective migration of neural crest cells. *Journal of Cell Biology*, 213(5), 543–555.
- Taha, E. A., and S. N. A. Al-Kahtani. 2013. Relationship between population size and productivity of honey bee colonies. *Journal of Entomology*, 10(3), 163–169.
- Tiang, E. R., L. Han, and F. Hu. 2025. Physicochemical characteristics, antioxidant capacity, and antimicrobial activity of stingless bee honey from Malaysia: *Heterotrigona itama*, *Lophotrigona canifrons*, and *Tetrigona binghami*. *Foods*, 14(6).

- Trianto, M., T. Arisuryanti, H. Purwanto, and R. Ubaidillah. 2023. Updated species check-list of the Indonesian stingless bees (*Hymenoptera*, *Apidae*, *Apinae*, *Meliponini*). *Journal of Tropical Biodiversity and Biotechnology*, 8(2).
- Trianto, M., T. Arisuryanti, H. Purwanto, and R. Ubaidillah. 2025. First record of *Heterotrigona itama* (Cockerell) from Sulawesi Island, Indonesia. *Indian Journal of Entomology*, 87(2), 248–250.
- United States Department of Agriculture. 1985. United states standards for grades of extracted honey. *Federal Register*, 50FR15861.
- Wang, S., B. Wittwer, T. A. Heard, J. Q. D. Goodger, and M. A. Elgar. 2018. Nonvolatile chemicals provide a nest defence mechanism for stingless bees *Tetragonula carbonaria* (*Apidae*, *Meliponini*). *Ethology*, 124(9), 633–640.
- Wongsa, K., O. Duangphakdee, P. Poolprasert, and A. Rattanawanee. 2024. External morphometric and microscopic analysis of the reproductive system in in vitro reared stingless bee queens, *Heterotrigona itama*, and their mating frequency. *PLoS ONE*, 19(9), e0306085.
- Wu, M. C., C. Y. Wu, K. Klaithin, K. K. Tiong, and C. C. Peng. 2022. Effect of harvest time span on physicochemical properties, antioxidant, antimicrobial, and anti-inflammatory activities of *Meliponinae* honey. *Journal of the Science of Food and Agriculture*, 102(13), 5750–5758.
- Ya'akob, H., N. F. Norhisham, M. Mohamed, N. Sadek, and S. Endrini. 2019. Evaluation of physicochemical properties of *Trigona sp.* stingless bee honey from various districts of Johor. *Jurnal Kejuruteraan*, SI2(1), 59–67.
- Zheng, X., X. Liang, L. Wu, X. Xue, Z. Wang, K. Wang, and W. Peng. 2022. Recent progress of stingless bee honey. *Science and Technology of Food Industry*, 43(1), 458–465.
- Zulkarnaini, Z., M. T. I. Wijaya, and S. Rahmadani. 2023. Introduksi teknologi budidaya dan pengolahan produk lebah galo-galo sebagai suplemen pencegahan stunting di nagari bukit Sikumpa kabupaten Lima Puluh Kota. *Jurnal Hilirisasi IPTEKS*, 6(4), 335–343.