

REFERENCES

- Abdelmoaty, M. M., Kadry, R., Mosley, R. L., & Gendelman, H. E. (2024). Neuroprotective mushrooms. *NeuroImmune Pharmacology and Therapeutics*, 3(2), <https://doi.org/10.1515/nipt-2024-0004>.
- Aktepe, N. (2024). Some functions of serotonin in the central nervous system. In A. Dundar & B. Bati (Eds.), *Brain Biochemistry and Its Disease* (1st ed., pp. 39–64), <https://doi.org/10.69860/nobel.9786053359371.3>.
- Al Azad, S., & Ai Ping, V. C. (2021). Comparison of protein and amino acids in the extracts of two edible mushrooms, *Pleurotus sajor-caju* and *Schizophyllum commune*. *Advances in Bioscience and Biotechnology*, 12(9), 286–296, <https://doi.org/10.4236/abb.2021.129018>.
- Alam, N., Amin, R., Khan, A., Ara, I., Shim, M.-J., Lee, M.-W., & Lee, T.-S. (2008). Nutritional analysis of cultivated mushrooms in Bangladesh—*Pleurotus ostreatus*, *Pleurotus sajor-caju*, *Pleurotus florida* and *Calocybe indica*. *Mycobiology*, 36(4), <https://doi.org/10.4489/MYCO.2008.36.4.228>.
- Alves Filho, E. G., Lima, M., Silva, L., Ribeiro, P., Tiwari, B. K., Fernandes, F. N., & Brito, E. S. (2021). Green ultrasound-assisted extraction of bioactive compounds from button mushrooms, potatoes, and onion peels. *ACS Food Science & Tech*, 1(7), <https://doi.org/10.1021/acsfoodscitech.1c00153>.
- Ambhore, J. P., Adhao, V. S., Rafique, S. S., Telgote, A. A., Dhoran, R. S., & Shende, B. A. (2024). A concise review: Edible mushroom and their medicinal

significance. *Exploration of Foods and Foodomics*, 2(3),

<https://doi.org/10.37349/eff.2024.00033>.

Badalyan, S. M., & Gharibyan, N. G. (2023). Biomass formation by different collections of *Pleurotus* spp. during submerged growth. *Proceedings of the YSU B: Chemical and Biological Sciences*, 3 (262),

<https://doi.org/10.46991/PYSU:B/2023.57.3.222>.

Baihaqi, B., Nuraida, N., Fridayati, D., & Adam, K. A. (2023). Ekstraksi oleoresin pala menggunakan metode UAE (Ultrasound Assisted Extraction). *Jurnal Sains Pertanian (JSP)*, 7(2), 42–45. <https://doi.org/10.51179/jsp.v7i2.1995>.

Bellmaine, S., Schnellbaecher, A., & Zimmer, A. (2020). Reactivity and degradation products of tryptophan in solution and proteins. *Free Radical Biology and Medicine*, 160, 696–718. <https://doi.org/10.1016/j.freeradbiomed.2020.09.002>.

Berger, P. D., Maurer, R. E., & Celli, G. B. (2018). Experimental design. *Springer International Publishing*. <https://doi.org/10.1007/978-3-319-64583-4>.

Braga, A., & Faria, N. (2022). Biotechnological production of specialty aromatic and aromatic-derivative compounds. *World Journal of Microbiology and Biotechnology*, 38(5), <https://doi.org/10.1007/s11274-022-03263-y>.

Bruncsics, B., Hullam, G., Bolgar, B., Petschner, P., Millinghoffer, A., Gecse, K., Eszlari, N., Gonda, X., Jones, D. J., Burden, S. T., Antal, P., Deakin, B., Bagdy, G., & Juhasz, G. (2023). Genetic risk of depression is different in subgroups of dietary ratio of tryptophan to large neutral amino acids. *Scientific Reports*, 13(1), <https://doi.org/10.1038/s41598-023-31495-x>.

- Buczko, P., Cylwik, D., & Stokowska, W. (2005). Metabolism of tryptophan via the kynurenine pathway in saliva. *Postepy Hig Med Dosw.*
- Carrasco-González, J. A., Serna-Saldívar, S. O., & Gutiérrez-Uribe, J. A. (2017). Nutritional composition and nutraceutical properties of the *Pleurotus* fruiting bodies: Potential use as food ingredient. *Journal of Food Composition and Analysis*, 58, 69–81, <https://doi.org/10.1016/j.jfca.2017.01.016>.
- Chaudhary, M., & John, P. (2017). Morphological and molecular characterization of oyster mushroom (*Pleurotus cystidiosus*). *International Journal of Current Microbiology and Applied Sciences*, 6(8), 246–250, <https://doi.org/10.20546/ijcmas.2017.608.033>.
- Chemat, F., Zill-e-Huma, & Khan, M. K. (2011). Applications of ultrasound in food technology: Processing, preservation and extraction. *Ultrasonics Sonochemistry*, 18(4), <https://doi.org/10.1016/j.ultsonch.2010.11.023>.
- Dzah, C. S., & Dzigbor, A. (2023). Ultrasound assisted extraction: A relook at solvent to material ratio, its effects on process efficiency and how it can be exploited for different uses. *Journal of Food Process Engineering*, 46(7), <https://doi.org/10.1111/jfpe.14339>.
- Effiong, M. E., Umeokwochi, C. P., Afolabi, I. S., & Chinedu, S. N. (2024). Assessing the nutritional quality of *Pleurotus ostreatus* (oyster mushroom). *Frontiers in Nutrition*, 10, <https://doi.org/10.3389/fnut.2023.1279208>.
- Ekute, B. O. (2019). Nutritional profile of two Nigerian edible mushrooms: *Pleurotus ostreatus* and *Pleurotus pulmonarius*. *Journal of Applied Sciences and Environmental Management*, 22(11), <https://doi.org/10.4314/jasem.v22i11.6>.

Elshreef, H. S., Mirghani, M. E. S., Sulaiman, S., & Jami, M. S. (2021). A review of

the effect of UAE optimization parameters on antioxidant activity. *IOP*

Conference Series: Earth and Environmental Science, 765(1),

<https://doi.org/10.1088/1755-1315/765/1/012109>.

Ferreira, S. L. C., Bruns, R. E., Ferreira, H. S., Matos, G. D., David, J. M., Brandão,

G. C., Da Silva, E. G. P., Portugal, L. A., Dos Reis, P. S., Souza, A. S., & Dos

Santos, W. N. L. (2007). Box-Behnken design: An alternative for the

optimization of analytical methods. *Analytica Chimica Acta*, 597(2),

<https://doi.org/10.1016/j.aca.2007.07.011>.

Girard, I., & Gonnet, C. (1982). Liquid chromatographic analysis of tryptophan and

serotonin metabolites: Comparison of UV, electrochemical, and

spectrofluorimetric detection. *Journal of Liquid Chromatography*, 5(12),

<https://doi.org/10.1080/01483918208067644>.

Grau, J., Chabowska, A., Werner, J., Zgoła-Grześkowiak, A., Fabjanowicz, M.,

Jatkowska, N., Chisvert, A., & Płotka-Wasylka, J. (2024). Deep eutectic

solvents with solid supports used in microextraction processes applied for

endocrine-disrupting chemicals. *Talanta*, 268,

<https://doi.org/10.1016/j.talanta.2023.125338>.

Guadarrama-Mendoza, P. C., Valencia Del Toro, G., Ramírez-Carrillo, R., Robles-

Martínez, F., Yáñez-Fernández, J., Garín-Aguilar, M. E., Hernández, C. G., &

Bravo-Villa, G. (2014). Morphology and mycelial growth rate of *Pleurotus* spp.

strains from the Mexican Mixtec region. *Brazilian Journal of Microbiology*, 45,

<https://doi.org/10.1590/S1517-83822014000300016>.

Ha, Choi, Jong In, Jeon, Dae-Hoon, Chi, Jeong-Hyun, & Shin, Pyung-Gyun. (2014).

Characteristics and breeding of a new variety *Pleurotus eryngii*, Saegonji.

Journal of Mushroom, 12(2), <https://doi.org/10.14480/JM.2014.12.2.127>.

Hamza, A., Mylarapu, A., Krishna, K. V., & Kumar, D. S. (2024). An insight into the nutritional and medicinal value of edible mushrooms: A natural treasury for human health. *Journal of Biotechnology*, 381, <https://doi.org/10.1016/j.jbiotec.2023.12.014>.

Hannah, K. A., Mangunwardoyo, W., & Saskiawan, I. (2020). Supplementation of bacterial indole-3-acetic acid to increase growth and productivity of white oyster mushroom (*Pleurotus ostreatus* (Jacq.) P. Kumm). *AIP Conference Proceedings*, 050018. <https://doi.org/10.1063/5.0012551>.

Harmita, H. (2004). Petunjuk pelaksanaan validasi metode dan cara perhitungannya. *Majalah Ilmu Kefarmasian*, 1(3), 117–135, <https://doi.org/10.7454/psr.v1i3.3375>.

International Council for Harmonisation (ICH). (1995). *ICH Topic Q 2 (R1) Validation of Analytical Procedures: Text and Methodology Step 5*.

Irshad, A., Tahir, A., Sharif, S., Khalid, A., Ali, S., Naz, A., Sadia, H., & Ameen, A. (2023). Determination of nutritional and biochemical composition of selected *Pleurotus* spp. *BioMed Research International*, 2023(1), 1, <https://doi.org/10.1155/2023/8150909>.

Jang, Jhune, Chang-Sung, Shin, Chul-Woo, Park, Jeong-Sik, Cheong, Jong-Chun, Choi, Sun-Gyu. (2003). Studies on the morphological and physiological characteristics of *Pleurotus cystidiosus* O. K. Miller, the Abalone Mushroom.

The Korean Journal of Mycology, 31(3),

<https://doi.org/10.4489/KJM.2003.31.3.141>.

Juárez-Hernández, E. O., Pérez-Zavala, M. D. L., Román-Reyes, M., Barboza-Corona, J. E., & Macías-Sánchez, K. L. (2023). Overview of *Pleurotus* spp., edible fungi with various functional properties. *International Food Research Journal*, 30(5), <https://doi.org/10.47836/ifrj.30.5.01>.

Kadam, P. V., Giram, D. K., Shaikh, S. K., Yadav, K. N., Karanje, A. S., & Patil, M. J. (2023). Pharmacognostic and chemical characterization studies on oyster mushroom (*Pleurotus ostreatus*). *Pharmacognosy Research*, 15(3), <https://doi.org/10.5530/pres.15.3.054>.

Kała, K., Lazur, J., Sułkowska-Ziaja, K., & Muszyńska, B. (2024). Edible mushrooms substances as natural prevention in autoimmune diseases. In S. K. Deshmukh, J. A. Takahashi, & S. Saxena (Eds.), *Fungi Bioactive Metabolites*, 339–369, Springer Nature Singapore. https://doi.org/10.1007/978-981-99-5696-8_11.

Kała, K., Pajak, W., Sułkowska-Ziaja, K., Krakowska, A., Lazur, J., Fidurski, M., Marzec, K., Zięba, P., Fijałkowska, A., Szewczyk, A., & Muszyńska, B. (2022). *Hypsizygus marmoreus* as a source of indole compounds and other bioactive substances with health-promoting activities. *Molecules*, 27(24), <https://doi.org/10.3390/molecules27248917>.

Kaliyaperumal, M., Kezo, K., & Gunaseelan, S. (2018). A global overview of edible mushrooms. In B. P. Singh, Lallawmsanga, & A. K. Passari (Eds.), *Biology of Macrofungi*, 15–56, Springer International Publishing. https://doi.org/10.1007/978-3-030-02622-6_2.

Kamei, N., Tamiwa, H., Miyata, M., Haruna, Y., Matsumura, K., Ogino, H., Hirano, S., Higashiyama, K., & Takeda-Morishita, M. (2018). Hydrophobic amino acid tryptophan shows promise as a potential absorption enhancer for oral delivery of biopharmaceuticals. *Pharmaceutics*, 10(4), <https://doi.org/10.3390/pharmaceutics10040182>.

Khemaissa, S., Walrant, A., & Sagan, S. (2022). Tryptophan: More than just an interfacial amino acid in the membrane activity of cationic cell-penetrating and antimicrobial peptides. *Quarterly Reviews of Biophysics*, 55, <https://doi.org/10.1017/S0033583522000105>.

Kirbağ, S., & Akyüz, M. (2010). Nutritive value of edible wild and cultured mushrooms. *Turkish Journal of Bio*. <https://doi.org/10.3906/biy-0805-17>.

Krakowska, A., Zięba, P., Włodarczyk, A., Kała, K., Sułkowska-Ziaja, K., Bernaś, E., Sękara, A., Ostachowicz, B., & Muszyńska, B. (2020). Selected edible medicinal mushrooms from *Pleurotus* genus as an answer for human civilization diseases. *Food Chemistry*, 327, <https://doi.org/10.1016/j.foodchem.2020.127084>.

Kumar, K., Srivastav, S., & Sharanagat, V. S. (2021). Ultrasound-assisted extraction (UAE) of bioactive compounds from fruit and vegetable processing by-products: A review. *Ultrasonics Sonochemistry*, 70, <https://doi.org/10.1016/j.ulstsonch.2020.105325>.

Kumar, S., & Netam, B. (2022). Study of wild edible mushrooms for improving human health and livelihoods support in Bastar Plateau, India. *Plant Archives*, 22(1), <https://doi.org/10.51470/plantarchives.2022.v22.no1.029>.

- Li, J. (2023). A comprehensive study of the effect of elevated temperature on the extractability and rate of exaggerated and exhaustive extractions of medical devices. *Journal of Pharmaceutical and Biomedical Analysis*, 235, <https://doi.org/10.1016/j.jpba.2023.115587>.
- Lins, P. G., Valle, C. R., Pugine, S. M. P., Oliveira, D. L., Ferreira, M. S. L., Costa, E. J. X., & De Melo, M. P. (2006). Effect of indole acetic acid administration on the neutrophil functions and oxidative stress from neutrophil, mesenteric lymph node, and liver. *Life Sciences*, 78(6), <https://doi.org/10.1016/j.lfs.2005.04.063>.
- López, A. R., Ortega-Caneda, E., Espada-Bellido, E., Chinchilla, N., Palma, M., Aliaño-González, M. J., Fernández Barbero, G., & Carrera, C. (2025). Development of a new eco-friendly ultrasound-assisted extraction method to quantify tryptophan in wild mushrooms and determination of its beneficial properties. *Food Chemistry*, 465, <https://doi.org/10.1016/j.foodchem.2024.142006>.
- Margret, A., Mareeswari, R., Kumar, K., & Jerley, A. (2021). Relative profiling of L-tryptophan derivatives from selected edible mushrooms as psychoactive nutraceuticals to inhibit P-glycoprotein: A paradigm to contest the blood-brain barrier. *BioTech*, 102(1), <https://doi.org/10.5114/bta.2021.103762>.
- Mazzutti, S., Ferreira, S. R. S., Riehl, C. A. S., Smania, A., Smania, F. A., & Martínez, J. (2012). Supercritical fluid extraction of *Agaricus brasiliensis*: Antioxidant and antimicrobial activities. *The Journal of Supercritical Fluids*, 70, <https://doi.org/10.1016/j.supflu.2012.06.010>.

- Mdachi, S. J. M., Nkunya, M. H. H., Nyigo, V. A., & Urasa, I. T. (2004). Amino acid composition of some Tanzanian wild mushrooms. *Food Chemistry*, 86(2), <https://doi.org/10.1016/j.foodchem.2003.08.030>.
- Milovanovic, I., Zengin, G., Maksimovic, S., & Tadic, V. (2021). Supercritical and ultrasound-assisted extracts from *Pleurotus pulmonarius* mushroom: Chemical profiles, antioxidative, and enzyme-inhibitory properties. *Journal of the Science of Food and Agriculture*, 101(6), <https://doi.org/10.1002/jsfa.10849>.
- Mishra, R. P., Mohammad, S., Sonika, P., Manjul, P., Deepshikha, & Mandvi, S. (2015). Characterization of *Pleurotus* sp. of mushroom based on phenotypic, biochemical, and yield parameters. *African Journal of Microbiology Research*, 9(13), <https://doi.org/10.5897/AJMR2014.7334>.
- Muszyńska, B., & Sułkowska-Ziaja, K. (2012). Analysis of indole compounds in edible Basidiomycota species after thermal processing. *Food Chemistry*, 132(1), <https://doi.org/10.1016/j.foodchem.2011.11.021>.
- Muszyńska, B., & Sułkowska-Ziaja, K. (2015). Impact of food processing on non-hallucinogenic indole derivatives in edible mushrooms. In *Processing and Impact on Active Components in Food*, 55–62, Elsevier. <https://doi.org/10.1016/B978-0-12-404699-3.00007-X>.
- Muszyńska, B., Piotrowska, J., Krakowska, A., Gruba, A., Kała, K., Sułkowska-Ziaja, K., Kryczyk, A., & Opoka, W. (2017). Study of physiologically active components in different parts of fruiting bodies of varieties of *Agaricus bisporus* (white mushroom). *European Food Research and Technology*, 243(12), <https://doi.org/10.1007/s00217-017-2914-2>.

Muszyńska, B., Sułkowska-Ziaja, K., & Wójcik, A. (2013). Levels of physiologically

active indole derivatives in the fruiting bodies of some edible mushrooms

(Basidiomycota) before and after thermal processing. *Mycoscience*, 54(5),

<https://doi.org/10.1016/j.myc.2012.11.002>.

Nallasamy, L., Harish Chandar, S. R., Bukhari, N. A., Murugavelu, G. S.,

Krishnamoorthy, D., Mahalakshmi, S., Swaminathan, A., & Chinnaswamy, A.

(2024). Functional characterization of promiscuous tryptophan decarboxylase

from indole alkaloids producing *Rauvolfia tetraphylla* L. *Journal of King Saud*

University - Science, 36(5), <https://doi.org/10.1016/j.jksus.2024.103182>.

Nguyen, D. T., Nguyen, P. T., Nguyen, B. V., Nguyen, C. Q., Vu, N. H., Hoang, P. T.,

La, D. D., & Nguyen, P. T. H. (2024). Ultrasound-assisted extraction of β -

glucan from Vietnam *Pleurotus citrinopileatus* enhances antioxidant activities.

The Natural Products Journal, 14.

<https://doi.org/10.2174/0122103155292732240610115317>.

Oktaviani, N. M. D., Larasati, I. D., Nugroho, A. W., Setyaningsih, W., & Palma, M.

(2024). Ultrasound-assisted extraction of L-tryptophan from chamomile

flower: Method development and application for flower parts characterization

and varietal difference. *Trends in Sciences*, 21(3),

<https://doi.org/10.48048/tis.2024.7348>.

Pan, Z., Qu, W., Ma, H., Atungulu, G. G., & McHugh, T. H. (2012). Continuous and

pulsed ultrasound-assisted extractions of antioxidants from pomegranate peel.

Ultrasonics Sonochemistry, 19(2),

<https://doi.org/10.1016/j.ulstsonch.2011.05.015>.

- Papi, S., Ahmadvand, H., Sotoodehnejadnematalahi, F., & Yaghmaei, P. (2022). The protective effects of indole-acetic acid on renal ischemia-reperfusion injury via antioxidant and anti-apoptotic properties in a rat model. *Iranian Journal of Kidney Diseases*, 16(2), <https://doi.org/10.52547/ijkd.6894>.
- Pérez-Álvarez, S., Hector-Ardisana, E. F., Rascón Solano, J., García García, S. A., Villarreal Ramírez, V. H., & Terrazas-Gómez, M. I. (2023). Edible mushrooms – Perspectives and considerations. *Notulae Scientia Biologicae*, 15(3), <https://doi.org/10.55779/nsb15311586>.
- Pham, M. T., Huang, C. M., & Kirschner, R. (2019). The plant growth-promoting potential of the mesophilic wood-rot mushroom *Pleurotus pulmonarius*. *Journal of Applied Microbiology*, 127(4), <https://doi.org/10.1111/jam.14375>.
- Poole, C. F. (2020). Solvent selection for liquid-phase extraction. In *Liquid-Phase Extraction*, 45–89, Elsevier. <https://doi.org/10.1016/B978-0-12-816911-7.00002-5>.
- Putra, I. P., Nurdebyandaru, N., Amelya, M. P., & Hermawan, R. (2022). Review: Current checklist of local names and utilization information of Indonesian wild mushrooms. *Journal of Tropical Biodiversity and Biotechnology*, 7(3), <https://doi.org/10.22146/jtbb.71407>.
- Qiao, C., Chen, F., Liu, Z., Huang, T., Li, W., Zhang, G., & Luo, Y. (2022). Functional characterization of a catalytically promiscuous tryptophan decarboxylase from camptothecin-producing *Camptotheca acuminata*. *Frontiers in Plant Science*, 13, <https://doi.org/10.3389/fpls.2022.987348>.

Qiu, Z., Wu, X., Gao, W., Zhang, J., & Huang, C. (2018). High temperature induced

disruption of the cell wall integrity and structure in *Pleurotus ostreatus* mycelia.

Applied Microbiology and Biotechnology, 102(15),

<https://doi.org/10.1007/s00253-018-9090-6>.

Rajarathnam, S., Bano, Z., & Miles, P. G. (1987). *Pleurotus* mushrooms. Part I A.

morphology, life cycle, taxonomy, breeding, and cultivation. *C R C Critical*

Reviews in Food Science and Nutrition, 26(2),

<https://doi.org/10.1080/10408398709527465>.

Ramić, M., Vidović, S., Zeković, Z., Vladić, J., Cvejin, A., & Pavlić, B. (2015).

Modeling and optimization of ultrasound-assisted extraction of polyphenolic compounds from *Aronia melanocarpa* by-products from filter-tea factory.

Ultrasonics Sonochemistry, 23,

<https://doi.org/10.1016/j.ulsonch.2014.10.002>.

Rangel-Vargas, E., Rodriguez, J. A., Domínguez, R., Lorenzo, J. M., Sosa, M. E.,

Andrés, S. C., Rosmini, M., Pérez-Alvarez, J. A., Teixeira, A., & Santos, E. M.

(2021). Edible mushrooms as a natural source of food ingredient/additive

replacer. *Foods*, 10(11), <https://doi.org/10.3390/foods10112687>.

Rosnina, A. G., Tan, Y. S., Abdullah, N., & Vikineswary, S. (2016). Morphological

and molecular characterization of yellow oyster mushroom, *Pleurotus citrinopileatus*, hybrids obtained by interspecies mating. *World Journal of*

Microbiology and Biotechnology, 32(2), [\[1959-2\]\(https://doi.org/10.1007/s11274-015-1959-2\).](https://doi.org/10.1007/s11274-015-</p></div><div data-bbox=)

- Saha, A., Mahali, K., & Roy, S. (2023). Solubility and solvation thermodynamics of L-tryptophan in aqueous methanol solvent mixtures. *Canadian Journal of Chemistry*, 101(8), <https://doi.org/10.1139/cjc-2022-0308>.
- Setyaningsih, W., Guamán-Balcázar, M. D. C., Oktaviani, N. M. D., & Palma, M. (2023). Response surface methodology optimization for analytical microwave-assisted extraction of resveratrol from functional marmalade and cookies. *Foods*, 12(2), <https://doi.org/10.3390/foods12020233>.
- Setyaningsih, W., Saputro, I. E., Palma, M., & Barroso, C. G. (2017). Optimization of the ultrasound-assisted extraction of tryptophan and its derivatives from rice (*Oryza sativa*) grains through a response surface methodology. *Journal of Cereal Science*, 75, <https://doi.org/10.1016/j.jcs.2017.04.006>.
- Shen, L., Pang, S., Zhong, M., Sun, Y., Qayum, A., Liu, Y., Rashid, A., Xu, B., Liang, Q., Ma, H., & Ren, X. (2023). A comprehensive review of ultrasonic assisted extraction (UAE) for bioactive components: Principles, advantages, equipment, and combined technologies. *Ultrasonics Sonochemistry*, 101, <https://doi.org/10.1016/j.ultsonch.2023.106646>.
- Singh, M., Kamal, S., & Sharma, V. (2021). Status and trends in world mushroom production-III-world production of different mushroom species in 21st century. *Mushroom Research*, 29(2), <https://doi.org/10.36036/MR.29.2.2020.113703>.
- Singh, Y. P., & Kumar, H. (2023). Tryptamine: A privileged scaffold for the management of Alzheimer's disease. *Drug Development Research*, 84(8), <https://doi.org/10.1002/ddr.22111>.

Smirnov, V. I. (2023). Features of L-tryptophan solvation in some water-organic

mixtures at T = 298.15 K. *Journal of Chemical & Engineering Data*, 68(3),

<https://doi.org/10.1021/acs.jced.2c00635>.

Stabnikova, O., Stabnikov, V., & Paredes-López, O. (2024). Wild and cultivated

mushrooms as food, pharmaceutical and industrial products. *Ukrainian Food*

Journal, 13(1), <https://doi.org/10.24263/2304-974X-2024-13-1-4>.

Sułkowska-Ziaja, K., Grabowska, K., Apola, A., Kryczyk-Poprawa, A., & Muszyńska,

B. (2021). Mycelial culture extracts of selected wood-decay mushrooms as a

source of skin-protecting factors. *Biotechnology Letters*, 43(5),

<https://doi.org/10.1007/s10529-021-03095-0>.

Sułkowska-Ziaja, K., Maślanka, A., Szewczyk, A., & Muszyńska, B. (2017a).

Physiologically active compounds in four species of *Phellinus*. *Natural*

Product, 12(3), <https://doi.org/10.1177/1934578X1701200313>.

Tejedor-Calvo, E., García-Barreda, S., Sánchez, S., Morte, A., Siles-Sánchez, M. D. L.

N., Soler-Rivas, C., Santoyo, S., & Marco, P. (2022). Application of

pressurized liquid extractions to obtain bioactive compounds from *Tuber*

aestivum and *Terfezia claveryi*. *Foods*, 11(3),

<https://doi.org/10.3390/foods11030298>.

Thompson, M., Ellison, S. L. R., & Wood, R. (2002). Harmonized guidelines for

single-laboratory validation of methods of analysis (IUPAC technical report).

Pure and Applied Chemistry, 74(5), <https://doi.org/10.1351/pac200274050835>.

Torres-Martínez, B. D. M., Vargas-Sánchez, R. D., Torrescano-Urrutia, G. R.,

Esqueda, M., Rodríguez-Carpena, J. G., Fernández-López, J., Perez-Alvarez, J.

- A., & Sánchez-Escalante, A. (2022). *Pleurotus* genus as a potential ingredient for meat products. *Foods*, 11(6), <https://doi.org/10.3390/foods11060779>.
- Tzin, V., & Galili, G. (2010). New insights into the shikimate and aromatic amino acids biosynthesis pathways in plants. *Molecular Plant*, 3(6), <https://doi.org/10.1093/mp/ssq048>.
- Ung, A. T., & Chen, H. (2024). Biological properties, health benefits and semisynthetic derivatives of edible *Astraeus* mushrooms (Diplocystidiaceae): A comprehensive review. *Chemistry & Biodiversity*, e202401295, <https://doi.org/10.1002/cbdv.202401295>.
- Vereycken, W., Van Stee, J., Riaño, S., Van Gerven, T., & Binnemans, K. (2022). Effect of dilution on the performance of ionic liquids in milliflow solvent extraction applications: Towards integration of extraction, scrubbing, and stripping operations with in-line membrane-based phase separation. *Separation and Purification Technology*, 297, <https://doi.org/10.1016/j.seppur.2022.121519>.
- Vinatoru, M., Mason, T. J., & Calinescu, I. (2017). Ultrasonically assisted extraction (UAE) and microwave-assisted extraction (MAE) of functional compounds from plant materials. *TrAC Trends in Analytical Chemistry*, 97, <https://doi.org/10.1016/j.trac.2017.09.002>.
- Vitalini, S., Dei Cas, M., Rubino, F. M., Vigentini, I., Foschino, R., Iriti, M., & Paroni, R. (2020). LC-MS/MS-based profiling of tryptophan-related metabolites in healthy plant foods. *Molecules*, 25(2), <https://doi.org/10.3390/molecules25020311>.

- Wang, Q., Wang, Y., Huang, M., Hayat, K., Kurtz, N. C., Wu, X., Ahmad, M., & Zheng, F. (2021). Ultrasound-assisted alkaline proteinase extraction enhances the yield of pecan protein and modifies its functional properties. *Ultrasonics Sonoch*, 80, <https://doi.org/10.1016/j.ulsonch.2021.105789>.
- Wang, W., Ma, X., Xu, Y., Cao, Y., Jiang, Z., Ding, T., Ye, X., & Liu, D. (2015). Ultrasound-assisted heating extraction of pectin from grapefruit peel: Optimization and comparison with the conventional method. *Food Chemistry*, 178, <https://doi.org/10.1016/j.foodchem.2015.01.080>.
- Włodarczyk, A., Krakowska, A., Sułkowska-Ziaja, K., Suchanek, M., Zięba, P., Opoka, W., & Muszyńska, B. (2020). *Pleurotus* spp. mycelia enriched in magnesium and zinc salts as a potential functional food. *Molecules*, 26(1), <https://doi.org/10.3390/molecules26010162>.
- Wu, H., Le, Q. N., Zeng, B., & Zhang, X. (2023). Nanoextraction from a flow of a highly diluted solution for much-improved sensitivity in offline chemical detection and quantification. *Analytica Chimica Acta*, 1274, <https://doi.org/10.1016/j.aca.2023.341529>.
- Xiaokang, W., Lyng, J. G., Brunton, N. P., Cody, L., Jacquier, J.-C., Harrison, S. M., & Papoutsis, K. (2020). Monitoring the effect of different microwave extraction parameters on the recovery of polyphenols from shiitake mushrooms: Comparison with hot-water and organic-solvent extractions. *Biotechnology Reports*, 27, <https://doi.org/10.1016/j.btre.2020.e00504>.



UNIVERSITAS
GADJAH MADA

OPTIMIZATION OF ULTRASOUND-ASSISTED EXTRACTION OF TRYPTOPHAN AND ITS
DERIVATIVES FROM OYSTER

MUSHROOM (*Pleurotus spp.*) THROUGH A RESPONSE SURFACE METHODOLOGY

Anita Nurmulya Bahari, Dr. Widiastuti Setyaningsih, S.T.P., M.Sc.

Universitas Gadjah Mada, 2025 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Xue, C., Li, G., Zheng, Q., Gu, X., Shi, Q., Su, Y., Chu, Q., Yuan, X., Bao, Z., Lu, J.,

& Li, L. (2023). Tryptophan metabolism in health and disease. *Cell Metabolism*, 35(8), <https://doi.org/10.1016/j.cmet.2023.06.004>.

Yousef, P., Rosen, J., & Shapiro, C. (2024). Tryptophan and its role in sleep and mood.

In *Studies in Natural Products Chemistry*, 80, Elsevier,
<https://doi.org/10.1016/B978-0-443-15589-5.00001-3>.