

BIBLIOGRAPHY

- Aaseth, J. O., Finnes, T. E., Askim, M., & Alexander, J. (2024). The Importance of Vitamin K and the Combination of Vitamins K and D for Calcium Metabolism and Bone Health: A Review. In *Nutrients* (Vol. 16, Number 15). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/nu16152420>
- Albarracín, M., Dyner, L., Giacomino, M. S., Weisstaub, A., Zuleta, A., & Drago, S. R. (2019). Modification of nutritional properties of whole rice flours (*Oryza sativa* L.) by soaking, germination, and extrusion. *Journal of Food Biochemistry*, 43(7). <https://doi.org/10.1111/jfbc.12854>
- Al-Taher, F., & Nemzer, B. (2023). Effect of Germination on Fatty Acid Composition in Cereal Grains. *Foods*, 12(17). <https://doi.org/10.3390/foods12173306>
- Aparicio-García, N., Martínez-Villaluenga, C., Frias, J., & Peñas, E. (2021). Sprouted oat as a potential gluten-free ingredient with enhanced nutritional and bioactive properties. *Food Chemistry*, 338. <https://doi.org/10.1016/j.foodchem.2020.127972>
- Association of Official Analytical Chemists. (1988). *Official Methods of Analysis of the Association of Official Analytical Chemists* (15th ed.). Association of Official Analytical Chemists.
- Basith, A., Arumingtyas, E. L., & Widodo, W. (2021). Genetic Variation Analysis of Four Local Varieties of Indonesian Black Rice (*Oryza sativa* L.) Based on Partially *rbcL* cpDNA Gene Sequence. *The Journal of Experimental Life Sciences*, 11(1), 1–5. <https://doi.org/10.21776/ub.jels.2021.011.01.01>
- Booth, S. L. (2012). Vitamin K: Food composition and dietary intakes. *Food and Nutrition Research*, 56. <https://doi.org/10.3402/fnr.v56i0.5505>
- Bourneow, & Toontam. (2019). Microbiological quality and some bioactive compounds in relation to sensory profiles during germination of brown-purple-pigmented rice. *International Food Research Journal*, 3(26), 1011–1021.
- Bumrungpert, A., Chongsuwat, R., Phosat, C., & Butacnum, A. (2018). Rice Bran Oil Containing Gamma-Oryzanol Improves Lipid Profiles and Antioxidant Status in Hyperlipidemic Subjects: A Randomized Double-Blind Controlled Trial. *Journal of Alternative and Complementary Medicine*, 25(3), 353–358. <https://doi.org/10.1089/acm.2018.0212>
- Center for Agricultural Data and Information Systems [Sekjen Pusdatin]. (2024). *Analysis of Rice Trade Performance in Indonesia 2024*.
- Chao, S., Mitchell, J., Prakash, S., Bhandari, B., & Fukai, S. (2021). Effect of germination level on properties of flour paste and cooked brown rice texture

of diverse varieties. *Journal of Cereal Science*, 102. <https://doi.org/10.1016/j.jcs.2021.103345>

Chatchavanthatri, N., Junyusen, T., Moolkaew, P., Arjharn, W., & Junyusen, P. (2020). Effect of soaking and sprouting treatment on germination rate of paddy. *E3S Web of Conferences*, 187. <https://doi.org/10.1051/e3sconf/202018704016>

Chinma, C. E., Adedeji, O. E., Jolayemi, O. S., Ezeocha, V. C., Ilowefah, M. A., Rosell, C. M., Adebo, J. A., Wilkin, J. D., & Adebo, O. A. (2024). Impact of germination on the techno-functional properties, nutritional composition, and health-promoting compounds of brown rice and its products: A review. In *Journal of Food Science* (Vol. 89, Number 1, pp. 8–32). John Wiley and Sons Inc. <https://doi.org/10.1111/1750-3841.16832>

Dewi, A. M. P., Setyaningsih, W., & Palma, M. (2024). Rapid Method for Simultaneous Determination of γ -Oryzanol Compounds in Rice (*Oryza sativa*) Grains using UV-Vis Spectroscopy and Chemometrics. *Trends in Sciences*, 21(12). <https://doi.org/10.48048/tis.2024.8550>

Dini, U. K., Mayangsari, Y., Ardiansyah, Shirakawa, H., & Saputra, W. D. (2024). Germinated IR-64 brown rice improves hyperglycemia in diabetic rats. *Nutrire*, 49(2). <https://doi.org/10.1186/s41110-024-00291-6>

Farahanah, I., Sahudin, S., Mohsin, H. F., Ariffin, S. A., & Aminuddin, L. D. (2025). Understanding Investigational Perspective of Antioxidant and Antibacterial Properties of Rice. In *Rice Science* (Vol. 32, Number 1, pp. 15–31). Elsevier B.V. <https://doi.org/10.1016/j.rsci.2024.10.004>

Fărcaș, A. C., Socaci, S. A., Nemeș, S. A., Pop, O. L., Coldea, T. E., Fogarasi, M., & Biriș-Dorhoi, E. S. (2022). An Update Regarding the Bioactive Compound of Cereal By-Products: Health Benefits and Potential Applications. In *Nutrients* (Vol. 14, Number 17). MDPI. <https://doi.org/10.3390/nu14173470>

Fauzi, F., Alsuheindra, A., & Efrina, E. (2023). Pengaruh Penambahan Tepung Rumput Laut terhadap Daya Terima Nasi IR 64. *Jurnal Mutu Pangan : Indonesian Journal of Food Quality*, 10(2), 84–92. <https://doi.org/10.29244/jmpi.2023.10.2.84>

Ferreira, D. W., Haytowitz, D. B., Tassinari, M. A., Peterson, J. W., & Booth, S. L. (2006). Vitamin K contents of grains, cereals, fast-food breakfasts, and baked goods. *Journal of Food Science*, 71(1). <https://doi.org/10.1111/j.1365-2621.2006.tb12408.x>

Filipovic, J., Ivkov, M., Kosutic, M., & Filipovic, V. (2016). Ratio of omega-6/omega-3 fatty acids of spelt and flaxseed pasta and consumer acceptability. *Czech Journal of Food Sciences*, 34(6), 522–528. <https://doi.org/10.17221/384/2015-CJFS>

Furianto, P., Budiari, S., Valentia Sode Muda, E., Mulyani, H., Maryati, Y., Handayani, N. A., Melanie, H., Fitria Devi, A., Artanti, N., Susilowati, A.,

- Aspiyanto, A., Filaila, E., & Sugiwati, S. (2024). The Influence of Soaking Condition and Germination on Antioxidant Activity, and Chemical Properties of White Waxy Corn. *E3S Web of Conferences*, 503. <https://doi.org/10.1051/e3sconf/202450305002>
- Goufo, P., & Trindade, H. (2014). Rice antioxidants: Phenolic acids, flavonoids, anthocyanins, proanthocyanidins, tocopherols, tocotrienols, c-oryzanol, and phytic acid. *Food Science and Nutrition*, 2(2), 75–104. <https://doi.org/10.1002/fsn3.86>
- Gu, X., Chen, I. G., Harding, S. A., Nyamdari, B., Ortega, M. A., Clermont, K., Westwood, J. H., & Tsai, C. J. (2021). Plasma membrane phyloquinone biosynthesis in nonphotosynthetic parasitic plants. *Plant Physiology*, 185(4), 1443–1456. <https://doi.org/10.1093/plphys/kiab031>
- Gunathunga, C., Senanayake, S., Jayasinghe, M. A., Brennan, C. S., Truong, T., Marapana, U., & Chandrapala, J. (2024). Germination effects on nutritional quality: A comprehensive review of selected cereals and pulses changes. In *Journal of Food Composition and Analysis* (Vol. 128). Academic Press Inc. <https://doi.org/10.1016/j.jfca.2024.106024>
- Hayashi, O., & Satoh, K. (2006). Determination of acetyl-CoA and malonyl-CoA in germinating rice seeds using the LC-MS/MS technique. *Bioscience, Biotechnology and Biochemistry*, 70(11), 2676–2681. <https://doi.org/10.1271/bbb.60269>
- Hayat, A., Jahangir, T. M., Khuhawar, M. Y., Alamgir, M., Siddiqui, A. J., & Musharraf, S. G. (2014). Simultaneous HPLC determination of gamma amino butyric acid (GABA) and lysine in selected Pakistani rice varieties by pre-column derivatization with 2-Hydroxynaphthaldehyde. *Journal of Cereal Science*, 60(2), 356–360. <https://doi.org/10.1016/j.jcs.2014.05.011>
- Hazra, A., & Das, S. (2024). The molecular and metabolic events behind different germination stages of rice seeds: A metabolomics perspective. In *JSFA reports* (Vol. 4, Number 3, pp. 118–134). John Wiley and Sons Ltd. <https://doi.org/10.1002/jsf2.185>
- He, L. yang, Yang, Y., Ren, L. kun, Bian, X., Liu, X. fei, Chen, F. lian, Tan, B., Fu, Y., Zhang, X. min, & Zhang, N. (2022). Effects of germination time on the structural, physicochemical and functional properties of brown rice. *International Journal of Food Science and Technology*, 57(4), 1902–1910. <https://doi.org/10.1111/ijfs.15118>
- Ho, H. J., Komai, M., & Shirakawa, H. (2020). Beneficial effects of vitamin k status on glycemic regulation and diabetes mellitus: A mini-review. In *Nutrients* (Vol. 12, Number 8, pp. 1–16). MDPI AG. <https://doi.org/10.3390/nu12082485>
- Hu, Y., Huang, X., Xiao, Q., Wu, X., Tian, Q., Ma, W., Shoaib, N., Liu, Y., Zhao, H., Feng, Z., & Yu, G. (2024). Advances in Plant GABA Research: Biological

Functions, Synthesis Mechanisms and Regulatory Pathways. In *Plants* (Vol. 13, Number 20). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/plants13202891>

Huang, M., Li, X., Hu, L., Xiao, Z., Chen, J., & Cao, F. (2021). Comparing texture and digestion properties between white and brown rice of indica cultivars preferred by Chinese consumers. *Scientific Reports*, 11(1). <https://doi.org/10.1038/s41598-021-98681-7>

Huang, S. H., & Ng, L. T. (2011). Quantification of tocopherols, tocotrienols, and γ -oryzanol contents and their distribution in some commercial rice varieties in Taiwan. *Journal of Agricultural and Food Chemistry*, 59(20), 11150–11159. <https://doi.org/10.1021/jf202884p>

Islam, S., Miah, M. A. S., Islam, M. F., Bhuiyan, M. N. I., Tisa, K. J., & Naim, M. R. (2024). Exploring the effects of spontaneous and solid-state fermentation on the physicochemical, functional and structural properties of whole wheat flour (*Triticum aestivum* L.). *Innovative Food Science and Emerging Technologies*, 97. <https://doi.org/10.1016/j.ifset.2024.103798>

Istanti, A., & Triasih, D. (2021). Respon Pertumbuhan dan Hasil Padi Hitam (*Oryza sativa* L) Lokal Banyuwangi terhadap Aplikasi Beberapa Jenis Pupuk Kandang. *Agriprima : Journal of Applied Agricultural Sciences*, 5(1), 25–33. <https://doi.org/10.25047/agriprima.v5i1.397>

Jiang, X., Xu, Q., Zhang, A., Liu, Y., Zhao, L., Gu, L., Yuan, J., Jia, H., Shen, X., Li, Z., Cao, D., & Zhang, D. (2021). Optimization of γ -Aminobutyric Acid (GABA) Accumulation in Germinating Adzuki Beans (*Vigna angularis*) by Vacuum Treatment and Monosodium Glutamate, and the Molecular Mechanisms. *Frontiers in Nutrition*, 8. <https://doi.org/10.3389/fnut.2021.693862>

Jie, F., Yin, G., Yang, W., Yang, M., Gao, S., Lv, J., & Li, B. (2018). Stress in regulation of GABA amygdala system and relevance to neuropsychiatric diseases. In *Frontiers in Neuroscience* (Vol. 12, Number AUG). Frontiers Media S.A. <https://doi.org/10.3389/fnins.2018.00562>

Jork, H., Funk, W., Fischer, W., & Wimmer, H. (1990). *Thin Layer Chromatography: Reagents and Detection Methods* (Vol. 1a). VCH Publishers.

Karladee, D., & Suriyong, S. (2012). γ -Aminobutyric acid (GABA) content in different varieties of brown rice during germination. *ScienceAsia*, 38(1), 13–17. <https://doi.org/10.2306/scienceasia1513-1874.2012.38.013>

Kazemzadeh, S., Farrokhi, N., Ahmadikhah, A., Tabar Heydar, K., Gilani, A., Askari, H., & Ingvarsson, P. K. (2024). Genome-wide association study and genotypic variation for the major tocopherol content in rice grain. *Frontiers in Plant Science*, 15. <https://doi.org/10.3389/fpls.2024.1426321>

- Khatun, L., Brahma, R., & Ray, S. (2023). Food Science and Applied Biotechnology Nutritional and functional potentials of germinated rice: A systematic review. *Food Science and Applied Biotechnology*, 2023(2), 263–281. <https://doi.org/10.30721/fsab2023.v6.i2>
- Kim, M. H., Ahn, S. Il, Lim, C. M., Jhoo, J. W., & Kim, G. Y. (2016). Effects of germinated brown rice addition on the flavor and functionality of yogurt. *Korean Journal for Food Science of Animal Resources*, 36(4), 508–515. <https://doi.org/10.5851/kosfa.2016.36.4.508>
- Kraithong, S., Liu, Y., Suwanangul, S., Sangsawad, P., Theppawong, A., & Bunyameen, N. (2025). A comprehensive review of the impact of anthocyanins from purple/black Rice on starch and protein digestibility, gut microbiota modulation, and their applications in food products. In *Food Chemistry* (Vol. 473). Elsevier Ltd. <https://doi.org/10.1016/j.foodchem.2025.143007>
- Kulasinghe, W. M. A. A., Wimalasiri, S., Samarasinghe, G., Silva, R., & Madhujith, T. (2018). Evaluation and Comparison of Vitamin Profiles of Selected Traditional Rice and Yams Grown in Sri Lanka. In *Tropical Agricultural Research* (Vol. 30, Number 2).
- Li, H., Li, X., Wang, G., Zhang, J., & Wang, G. (2022). Analysis of gene expression in early seed germination of rice: landscape and genetic regulation. *BMC Plant Biology*, 22(1). <https://doi.org/10.1186/s12870-022-03458-3>
- Li, J., Yang, S., Zhong, Z., Xia, T., Zhou, W., Tu, Z., Chen, Z., Wang, H., Dai, Z., Jin, G., & Du, Y. (2025). Effects of degree of milling on bran layer structure, physicochemical properties and cooking quality of brown rice. *Food Chemistry*, 462. <https://doi.org/10.1016/j.foodchem.2024.140847>
- Li, W., Niu, Y., Zheng, Y., & Wang, Z. (2022). Advances in the Understanding of Reactive Oxygen Species-Dependent Regulation on Seed Dormancy, Germination, and Deterioration in Crops. In *Frontiers in Plant Science* (Vol. 13). Frontiers Media S.A. <https://doi.org/10.3389/fpls.2022.826809>
- Ling, Z. N., Jiang, Y. F., Ru, J. N., Lu, J. H., Ding, B., & Wu, J. (2023). Amino acid metabolism in health and disease. In *Signal Transduction and Targeted Therapy* (Vol. 8, Number 1). Springer Nature. <https://doi.org/10.1038/s41392-023-01569-3>
- Liyanaarachchi, G. V. V., Mahanama, K. R. R., Somasiri, H. P. P. S., Punyasiri, P. A. N., & Kottawa-Arachchi, J. D. (2020). Total and free amino acid contents of popular rice varieties (*Oryza sativa* L.) consumed in the capital city of Sri Lanka. *Journal of the National Science Foundation of Sri Lanka*, 48(2), 199–211. <https://doi.org/10.4038/jnsfsr.v48i2.9565>
- Mackill, D. J., & Khush, G. S. (2018). IR64: a high-quality and high-yielding mega variety. In *Rice* (Vol. 11, Number 1). Springer New York LLC. <https://doi.org/10.1186/s12284-018-0208-3>

- Maguire, J. (2018). The relationship between GABA and stress: ‘it’s complicated.’ *Journal of Physiology*, 596(10), 1781–1782. <https://doi.org/10.1113/JP275937>
- Man, P. V, Hai, T. C., Hanh, P. T. H., & Thanh, L. T. (2021). The study of soaking and germination times to improve the nutritional quality of white and black glutinous rice. In *Asia-Pacific Journal of Science and Technology*. <https://www.tci-thaijo.org/index.php/APST/index>
- Mantiri, S. A., Mayangsari, Y., Ardiansyah, Shirakawa, H., & Saputra, W. D. (2024). In vivo evaluation of germinated IR-64 brown rice dietary administration on the lipid blood profiles of rats with hypercholesterolemia. *Nutrire*, 49(2). <https://doi.org/10.1186/s41110-024-00287-2>
- Mishima, E., Wahida, A., Seibt, T., & Conrad, M. (2023). Diverse biological functions of vitamin K: from coagulation to ferroptosis. *Nature Metabolism*, 5(6), 924–932. <https://doi.org/10.1038/s42255-023-00821-y>
- Mohammed, N., Kuna, A., Sarkar, S., Azam, M., K. L. prasanna, & V. K. kiran. (2021). Effect of germination on yield, physico-chemical properties, nutritional composition and GABA content in germinated brown rice. *Oryza-An International Journal on Rice*, 58(4), 496–505. <https://doi.org/10.35709/ory.2021.58.4.5>
- Molska, M., Reguta, J., Rudzinska, M., & Swieca, M. (2020). Fatty acid profile, atherogenic and thrombogenic health lipid indices of lyophilized buckwheat sprouts modified with the addition of *Saccharomyces cerevisiae* var. *boulardii*. *Acta Scientiarum Polonorum, Technologia Alimentaria*, 19(4), 483–490. <https://doi.org/10.17306/J.AFS.2020.0866>
- Moongngarm, A., & Khomphiphatkul, E. (2011). Germination Time Dependence of Bioactive Compounds and Antioxidant Activity in Germinated Rough Rice (*Oryza sativa* L.). *American Journal of Applied Sciences*, 8(1), 15–25.
- Munarko, H., Boing Sitanggang, A., Kusnandar, F., & Budijanto, S. (2019). *Kecambah Beras Pecah Kulit : Proses Produksi dan Karakteristiknya*.
- Munarko, H., Sitanggang, A. B., Kusnandar, F., & Budijanto, S. (2022). Germination of five Indonesian brown rice: evaluation of antioxidant, bioactive compounds, fatty acids and pasting properties. *Food Science and Technology (Brazil)*, 42. <https://doi.org/10.1590/fst.19721>
- Murakami, R., Ohsaki, Y., Ito, H., Ho, H.-J., Agista, A. Z., Chiang, Y.-F., Chen, Y.-L., Maekawa, M., Hirose, T., Hara, K., Chiu, W.-C., Yeh, C.-L., Hsia, S.-M., Yang, S.-C., Mano, N., Mori, T., & Shirakawa, H. (2026). Effect of Vitamin K Supplementation on Testosterone Production in a Rat Model of Late-Onset Hypogonadism. *Foods*, 15(6), 1070. <https://doi.org/10.3390/foods15061070>
- Nakamura, S., & Ohtsubo, K. (2025). Change in Fatty Acid Composition in High-Temperature-Damaged Rice Grains and Its Effects on the Appearance and

Physical Qualities of the Cooked Rice. *Foods*, 14(17).
<https://doi.org/10.3390/foods14173097>

- Nikooyeh, B., Zargaraan, A., Ebrahimof, S., Kalayi, A., Zahedirad, M., Yazdani, H., Rismanchi, M., Karami, T., Khazraei, M., Jafarpour, A., & Neyestani, T. R. (2023). Daily consumption of γ -oryzanol-fortified canola oil, compared with unfortified canola and sunflower oils, resulted in a better improvement of certain cardiometabolic biomarkers of adult subjects with type 2 diabetes: a randomized controlled clinical trial. *European Journal of Medical Research*, 28(1). <https://doi.org/10.1186/s40001-023-01409-8>
- Nikooyeh, B., Zargaraan, A., Ebrahimof, S., Kalayi, A., Zahedirad, M., Yazdani, H., Rismanchi, M., Karami, T., Khazraei, M., Jafarpour, A., & Neyestani, T. R. (2024). Added γ -oryzanol boosted anti-inflammatory effects of canola oil in adult subjects with type 2 diabetes: a randomized controlled clinical trial. *European Journal of Nutrition*, 63(2), 425–433. <https://doi.org/10.1007/s00394-023-03275-w>
- Ospankulova, G., Temirova, I., Toimbayeva, D., Saduakhasova, S., Tazhina, S., Khamitova, D., Muratkhan, M., Aldiyeva, A., & Zhumalin, A. (2025). The Effect of Germination Duration on the Biochemical Indicators and Functional-Technological Properties of Triticale Grain. *Applied Sciences (Switzerland)*, 15(10). <https://doi.org/10.3390/app15105596>
- Ota, K., Inoguchi, H., Mitsunaga, T., & Ashizawa, T. (2025). Promotion of germination, rooting, and seedling emergence of rice (*Oryza sativa* L.) by soaking seeds in converter slag suspension before sowing. *Soil Science and Plant Nutrition*, 71(1), 68–78. <https://doi.org/10.1080/00380768.2024.2405835>
- Park, S. Y., Kim, Y., Park, M. J., & Kim, J. Y. (2025). Rice Bran Consumption Improves Lipid Profiles: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. In *Nutrients* (Vol. 17, Number 1). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/nu17010114>
- Parnsakhorn, S., & Langkapin, J. (2018). Effects of drying temperatures on physicochemical properties of germinated brown rice. *Songklanakarin J. Sci. Technol*, 40(1), 127–134.
- Paucar-Menacho, L. M., Martínez-Villaluenga, C., Dueñas, M., Frias, J., & Peñas, E. (2017). Optimization of germination time and temperature to maximize the content of bioactive compounds and the antioxidant activity of purple corn (*Zea mays* L.) by response surface methodology. *LWT*, 76, 236–244. <https://doi.org/10.1016/j.lwt.2016.07.064>
- Pede, V. O., Valera, H. G., Mishra, A. K., & Balié, J. (2024). Future of Rice in Asia: Perspectives and Opportunities, 2050. In *Food Security Issues in Asia* (pp.

108–138). World Scientific Publishing Co.
https://doi.org/10.1142/9789811278297_0005

- Phuengjayaem, S., Kuncharoen, N., Booncharoen, A., Ongpipattanakul, B., & Tanasupawat, S. (2021). Genome analysis and optimization of γ -aminobutyric acid (GABA) production by lactic acid bacteria from plant materials. *Journal of General and Applied Microbiology*, 67(4), 150–161. <https://doi.org/10.2323/jgam.2020.10.002>
- Pokkanta, P., Sookwong, P., Tanang, M., Setchaiyan, S., Boontakham, P., & Mahatheeranont, S. (2019). Simultaneous determination of tocopherols, γ -oryzanols, phytosterols, squalene, cholecalciferol and phylloquinone in rice bran and vegetable oil samples. *Food Chemistry*, 271, 630–638. <https://doi.org/10.1016/j.foodchem.2018.07.225>
- Pramai, P., Abdul Hamid, N. A., Mediani, A., Maulidiani, M., Abas, F., & Jiamyangyuen, S. (2018). Metabolite profiling, antioxidant, and α -glucosidase inhibitory activities of germinated rice: nuclear-magnetic-resonance-based metabolomics study. *Journal of Food and Drug Analysis*, 26(1), 47–57. <https://doi.org/10.1016/j.jfda.2016.11.023>
- Pratiwi, R., Amalia, A. R., Anindito Sri Tunjung, W., & Rumiati. (2019). Active fractions of black rice bran cv cempo ireng inducing apoptosis and S-phase cell cycle arrest in T47D breast cancer cells. *Journal of Mathematical and Fundamental Sciences*, 51(1), 47–59. <https://doi.org/10.5614/j.math.fund.sci.2019.51.1.4>
- Qiu, D., Duan, R., Wang, Y., He, Y., Li, C., Shen, X., & Li, Y. (2023). Effects of different drying temperatures on the profile and sources of flavor in semi-dried golden pompano (*Trachinotus ovatus*). *Food Chemistry*, 401. <https://doi.org/10.1016/j.foodchem.2022.134112>
- Ravaut, G., Légit, A., Bergeron, K. F., & Mounier, C. (2021). Monounsaturated fatty acids in obesity-related inflammation. In *International Journal of Molecular Sciences* (Vol. 22, Number 1, pp. 1–22). MDPI AG. <https://doi.org/10.3390/ijms22010330>
- Salamah, M. P., Mayangsari, Y., Shirakawa, H., Agista, A. Z., & Saputra, W. D. (2026). Germinated Cempo Ireng Black Rice (*Oryza sativa* L.) Demonstrates Functional Anti-Obesity Effects in High-Fat Diet-Induced Rats. *Trends in Sciences*, 23(8), 12735. <https://doi.org/10.48048/tis.2026.12735>
- Salma, Ahmad, S. S., Karim, S., Ibrahim, I. M., Alkreathy, H. M., Alsieni, M., & Khan, M. A. (2022). Effect of Vitamin K on Bone Mineral Density and Fracture Risk in Adults: Systematic Review and Meta-Analysis. In *Biomedicines* (Vol. 10, Number 5). MDPI. <https://doi.org/10.3390/biomedicines10051048>
- Saloni, Rai, D. C., Duany, R. K., & Singh, R. K. (2025). Bio-functional Compounds in Pigmented Rice: Recent Updates on Extractions, Delivery Mode, and

Application in Food Systems. In *Food and Bioprocess Technology* (Vol. 18, Number 5, pp. 4251–4279). Springer. <https://doi.org/10.1007/s11947-024-03734-0>

Samaranayake, M. D. W., Abeysekera, W. K. S. M., Hewajulige, I. G. N., Somasiri, H. P. P. S., Mahanama, K. R. R., Senanayake, D. M. J. B., & Premakumara, G. A. S. (2024). Saturated, monounsaturated and polyunsaturated fatty acid profiles of commercially important traditional and new improved red and white rice varieties of Sri Lanka. *Journal of Food Composition and Analysis*, 130. <https://doi.org/10.1016/j.jfca.2024.106154>

Sapwarobol, S., Saphyakhajorn, W., & Astina, J. (2021). Biological Functions and Activities of Rice Bran as a Functional Ingredient: A Review. In *Nutrition and Metabolic Insights* (Vol. 14). SAGE Publications Ltd. <https://doi.org/10.1177/11786388211058559>

Settle, F. A. (1997). *Handbook of Instrumental Techniques for Analytical Chemistry*. Prentice Hall.

Simopoulos, A. P. (2008). The importance of the omega-6/omega-3 fatty acid ratio in cardiovascular disease and other chronic diseases. In *Experimental Biology and Medicine* (Vol. 233, Number 6, pp. 674–688). <https://doi.org/10.3181/0711-MR-311>

Sitanggang, A. B., Joshua, M., Munarko, H., Kusnandar, F., & Budijanto, S. (2021). Increased γ -aminobutyric acid content of germinated brown rice produced in membrane reactor. *Food Technology and Biotechnology*, 59(3), 295–305. <https://doi.org/10.17113/ftb.59.03.21.6846>

Statistics Indonesia [BPS]. (2024). *Harvested Area and Rice Production in Indonesia 2023 (Final Figures)*.

Sultana, H., Kato, A., Ohashi, A., Takashima, R., Katsurai, T., Sato, S., Monma, M., Ohsaki, Y., Goto, T., Komai, M., & Shirakawa, H. (2021). Effect of vitamin k-mediated pxx activation on drug-metabolizing gene expression in human intestinal carcinoma ls180 cell line. *Nutrients*, 13(5). <https://doi.org/10.3390/nu13051709>

Sun, Q., Spiegelman, D., Van Dam, R. M., Holmes, M. D., Malik, V. S., Willett, W. C., & Hu, F. B. (2010). White rice, brown rice, and risk of type 2 diabetes in US men and women. *Archives of Internal Medicine*, 170(11), 961–969. <https://doi.org/10.1001/archinternmed.2010.109>

Tavakoli, Z., Kavooosi, G., Siahbalaee, R., & Karimi, J. (2025). Spirulina maxima as a valuable ingredient: Determination of broad fatty acid and amino acid profiles and nutritional quality and anti-amylase capacity. *Applied Food Research*, 5(1). <https://doi.org/10.1016/j.afres.2025.100741>

Tiozon, R. N., Lenaerts, B., Kor, S., Demont, M., Fernie, A. R., & Sreenivasulu, N. (2025). Low glycemic index rice: a healthier diet for countering diabetes

- epidemic in Asia. In *Trends in Plant Science* (Vol. 30, Number 6, pp. 603–614). Elsevier Ltd. <https://doi.org/10.1016/j.tplants.2024.11.003>
- Tremmel-Bede, K., Szentmiklóssy, M., Lampi, A. M., Piironen, V., Shewry, P. R., Vida, G., Tömösközi, S., Karsai, I., Láng, L., Bedő, Z., & Rakszegi, M. (2022). Variation in the Content and Composition of Tocols in a Wheat Population. *Foods*, 11(9). <https://doi.org/10.3390/foods11091343>
- Ukpong, E. S., Okpalanma, E. F., Attaugwu, R. N., Oladeji, B. S., & Onyeukwu, U. C. (2023). Effects of Milling, Germination Temperature and Time on Nutrients, Bioactive Compounds and Pasting Properties of FARO 44 Brown Rice. *Journal of Food Chemistry and Nanotechnology*, 9(2), 78–87. <https://doi.org/10.17756/jfcn.2023-153>
- Ukpong, E. S., Okpalanma, E. F., & Onyeka, U. E. (2024). Food Science and Applied Biotechnology NERICA-8 brown rice: its pasting properties, nutrients and bioactive compounds as affected by milling, germination temperature and germination time. *Food Science and Applied Biotechnology*, 2024(1), 36–48. <https://doi.org/10.30721/fsab2024.v7.i1>
- Untereiner, A., Abdo, S., Bhattacharjee, A., Gohil, H., Pourasgari, F., Ibeh, N., Lai, M., Batchuluun, B., Wong, A., Khuu, N., Liu, Y., Rijjal, D. Al, Winegarden, N., Virtanen, C., Orser, B. A., Cabrera, O., Varga, G., Rocheleau, J., Dai, F. F., & Wheeler, M. B. (2019). GABA promotes β -cell proliferation, but does not overcome impaired glucose homeostasis associated with diet-induced obesity. *FASEB Journal*, 33(3), 3968–3984. <https://doi.org/10.1096/fj.201801397R>
- U.S. Department of Agriculture, E. R. S. (2025). *Rice Sector at a Glance*. <https://www.ers.usda.gov/topics/crops/rice/rice-sector-at-a-glance/>
- van Ballegooijen, A. J., & Beulens, J. W. (2017). The Role of Vitamin K Status in Cardiovascular Health: Evidence from Observational and Clinical Studies. In *Current Nutrition Reports* (Vol. 6, Number 3, pp. 197–205). Current Science Inc. <https://doi.org/10.1007/s13668-017-0208-8>
- van Hung, P., Maeda, T., Yamamoto, S., & Morita, N. (2012). Effects of germination on nutritional composition of waxy wheat. *Journal of the Science of Food and Agriculture*, 92(3), 667–672. <https://doi.org/10.1002/jsfa.4628>
- Velasco, L., Matías, J., Cruz, V., & Fondevilla, S. (2025). Genetic and environmental influences on fatty acid and tocopherol diversity in quinoa germplasm. *Frontiers in Plant Science*, 16. <https://doi.org/10.3389/fpls.2025.1541895>
- Verma, D. K., & Srivastav, P. P. (2020). Bioactive compounds of rice (*Oryza sativa* L.): Review on paradigm and its potential benefit in human health. In *Trends in Food Science and Technology* (Vol. 97, pp. 355–365). Elsevier Ltd. <https://doi.org/10.1016/j.tifs.2020.01.007>

- Wang, H., & Ma, Y. (2023). The Potential of Vitamin K as a Regulatory Factor of Bone Metabolism—A Review. In *Nutrients* (Vol. 15, Number 23). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/nu15234935>
- Wu, X., Guo, T., Luo, F., & Lin, Q. (2023). Brown rice: a missing nutrient-rich health food. In *Food Science and Human Wellness* (Vol. 12, Number 5, pp. 1458–1470). KeAi Communications Co. <https://doi.org/10.1016/j.fshw.2023.02.010>
- Xia, D., Zhou, H., Wang, Y., Li, P., Fu, P., Wu, B., & He, Y. (2021). How rice organs are colored: The genetic basis of anthocyanin biosynthesis in rice. In *Crop Journal* (Vol. 9, Number 3, pp. 598–608). Institute of Crop Sciences. <https://doi.org/10.1016/j.cj.2021.03.013>
- Xiao, Y., Yu, Y., Li, G., Xie, L., Guo, X., Li, J., Li, Y., & Hu, J. (2020). Genome-wide association study of vitamin E in sweet corn kernels. *Crop Journal*, 8(2), 341–350. <https://doi.org/10.1016/j.cj.2019.08.002>
- Xiong, Z., Liu, L., Jian, Z., Ma, Y., Li, H., Jin, X., Liao, B., & Wang, K. (2023). Vitamin E and Multiple Health Outcomes: An Umbrella Review of Meta-Analyses. In *Nutrients* (Vol. 15, Number 15). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/nu15153301>
- Xu, J., Ge, Z., Wang, H., Zhang, C., Xu, J., Li, Y., Yang, X., Zhang, L., Li, Z., Liu, Z., Wang, G., & Du, J. (2025). Long-term GABA supplementation mitigates anxiety by modulating complement and neuroinflammatory pathways. *Npj Science of Food*, 9(1). <https://doi.org/10.1038/s41538-025-00423-w>
- Yamuangmorn, S., Saenjum, C., & Prom-u-thai, C. (2024). Germination alters the bioactive compounds of pigmented and non-pigmented rice varieties in fresh and year-old stored seeds. *Food Chemistry: X*, 24. <https://doi.org/10.1016/j.fochx.2024.102005>
- Yang, Q., Zhao, D., & Liu, Q. (2020). Connections Between Amino Acid Metabolisms in Plants: Lysine as an Example. In *Frontiers in Plant Science* (Vol. 11). Frontiers Media S.A. <https://doi.org/10.3389/fpls.2020.00928>
- Yi, C., Qiang, N., Zhu, H., Xiao, Q., & Li, Z. (2022). Extrusion processing: A strategy for improving the functional components, physicochemical properties, and health benefits of whole grains. In *Food Research International* (Vol. 160). Elsevier Ltd. <https://doi.org/10.1016/j.foodres.2022.111681>
- Yi, X., & Li, C. (2022). Main controllers for improving the resistant starch content in cooked white rice. In *Food Hydrocolloids* (Vol. 122). Elsevier B.V. <https://doi.org/10.1016/j.foodhyd.2021.107083>
- Yu, J., Balaji, B., Tinajero, M., Jarvis, S., Khan, T., Vasudevan, S., Ranawana, V., Poobalan, A., Bhupathiraju, S., Sun, Q., Willett, W., Hu, F. B., Jenkins, D. J. A., Mohan, V., & Malik, V. S. (2022). White rice, brown rice and the risk of

type 2 diabetes: a systematic review and meta-analysis. In *BMJ Open* (Vol. 12, Number 9). BMJ Publishing Group. <https://doi.org/10.1136/bmjopen-2022-065426>

- Yu, Y., Li, M., Li, C., Niu, M., Dong, H., Zhao, S., Jia, C., & Xu, Y. (2023). Accelerated Accumulation of γ -Aminobutyric Acid and Modifications on Its Metabolic Pathways in Black Rice Grains by Germination under Cold Stress. *Foods*, 12(6). <https://doi.org/10.3390/foods12061290>
- Zafar, S., & Jianlong, X. (2023). Recent Advances to Enhance Nutritional Quality of Rice. In *Rice Science* (Vol. 30, Number 6, pp. 523–536). Elsevier B.V. <https://doi.org/10.1016/j.rsci.2023.05.004>
- Zhang, L., Hao, N., Li, W., Zhang, B., Shi, T., Xie, M., & Yu, M. (2022). Effect of Ultrasonic Induction on the Main Physiological and Biochemical Indicators and γ -Aminobutyric Acid Content of Maize during Germination. *Foods*, 11(9). <https://doi.org/10.3390/foods11091358>
- Zhang, Q., Zhu, L., Li, H., Chen, Q., Li, N., Li, J., Zhao, Z., Xiao, D., Tang, T., Bi, C., Zhang, Y., Zhang, H., Zhang, G., Li, M., Zhu, Y., Zhang, J., & Kong, J. (2024). Insights and progress on the biosynthesis, metabolism, and physiological functions of gamma-aminobutyric acid (GABA): a review. In *PeerJ* (Vol. 12, Number 12). PeerJ Inc. <https://doi.org/10.7717/peerj.18712>
- Zhao, M., Xiao, X., Jin, D., Zhai, L., Li, Y., Yang, Q., Xing, F., Qiao, W., Yan, X., & Tang, Q. (2025). Composition and Biological Activity of Colored Rice—A Comprehensive Review. In *Foods* (Vol. 14, Number 8). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/foods14081394>
- Zhou, Y., & Danbolt, N. C. (2014). Glutamate as a neurotransmitter in the healthy brain. In *Journal of Neural Transmission* (Vol. 121, Number 8, pp. 799–817). <https://doi.org/10.1007/s00702-014-1180-8>
- Zhu, C., Yang, L., Wu, Y., Sun, X., & Song, L. (2023). Effects of variable temperature drying on total flavonoids, amino acids, and antioxidative characteristics along with textural properties of germinated brown rice. *Food Science and Technology*, 43, 1–9. <https://doi.org/10.5327/fst.1523>