

DAFTAR PUSTAKA

- Aalim, H., Hashim, S. B. H., Zhou, C., Zou, X., & Luo, Z. (2024). Matrix characteristics modulate black rice phenolic compounds bioaccessibility and antioxidant activity during simulated gastrointestinal digestion. *Food Bioscience*, 58. <https://doi.org/10.1016/j.fbio.2024.103628>
- Adameczyk, B., Simon, J., Kitunen, V., Adameczyk, S., & Smolander, A. (2017). Tannins and Their Complex Interaction with Different Organic Nitrogen Compounds and Enzymes: Old Paradigms versus Recent Advances. Dalam *ChemistryOpen* (Vol. 6, Nomor 5, hlm. 610–614). Wiley-VCH Verlag. <https://doi.org/10.1002/open.201700113>
- Afreen, S., Kumar, A., Sinha, K. P., Kumar, M., & Singh, P. K. (2021). Evaluation of zinc and iron treatment on growth and seed yield in paddy (*Oryza sativa* L.). ~ 61 ~ *The Pharma Innovation Journal*, 10(10). <http://www.thepharmajournal.com>
- Ahmad, Z., Ahmad, A., Subtain, M., & Naeem, M. (2025). Antinutritional characterization in plant foods; health consequences and reduction strategies. Dalam *Journal of Food Measurement and Characterization*. Springer. <https://doi.org/10.1007/s11694-025-03432-1>
- Alfarabi, M., Safithri, M., Cing, J. M., Arodes, E. S., Andrianto, D., Kurniasih, R., & Hutapea, H. E. C. (2025). Antioxidant and Antiproliferative Activity of Black Rice Extract Against Colon Cancer Cells In-Vitro and In-Silico. *Trends in Sciences*, 22(10). <https://doi.org/10.48048/tis.2025.10397>
- Alotaibi, S. H., Babiker, E. E., Alshammari, G. M., & Yahya, M. A. (2024). The Effect of Cooking and Simulated Digestion on the Antioxidants and Minerals in Rice Grains: A Predictor for Nutritional Efficiency. *Agriculture (Switzerland)*, 14(8). <https://doi.org/10.3390/agriculture14081270>
- Ankul, S., Begum, R. F., Singh, S., & Margesan, T. (2025). Tannins as Therapeutic in Managing Obesity and Beyond. Dalam *Current Pharmacology Reports* (Vol. 11, Nomor 1). Springer Science and Business Media Deutschland GmbH. <https://doi.org/10.1007/s40495-025-00398-y>
- Azeke, M. A., Egielewa, S. J., Eigbogbo, M. U., & Ihimire, I. G. (2011). Effect of germination on the phytase activity, phytate and total phosphorus contents of rice (*Oryza sativa*), maize (*Zea mays*), millet (*Panicum*

miliaceum), sorghum (*Sorghum bicolor*) and wheat (*Triticum aestivum*).
Journal of Food Science and Technology, 48(6), 724–729.
<https://doi.org/10.1007/s13197-010-0186-y>

Beladhadi, R. V., Shankar, K., Jayalakshmi, S. K., & Sreeramulu, K. (2023).
Valorization of rice biomass by a green approach to release phenolic
compounds and their antioxidant activities. *Preparative Biochemistry and
Biotechnology*, 53(1), 93–100.
<https://doi.org/10.1080/10826068.2022.2042821>

Benamirouche, S., Chouial, M., Guechi, W., & Nanfack, R. F. (2020). Radicle
length and container size effects on root deformities in the mediterranean
oak quercus suber l. *Bois et Forets des Tropiques*, 343, 17–26.
<https://doi.org/10.19182/bft2020.343.a31669>

Borgi, M. A., Boudebhouze, S., Mkaouar, H., Maguin, E., & Rhimi, M. (2015).
Bacillus phytases: Current status and future prospects. *Bioengineered*, 6(4),
233–236. <https://doi.org/10.1080/21655979.2015.1048050>

BPS. (2025). *Rata-rata Konsumsi Perkapita Seminggu Menurut Kelompok Padi-
Padian Per Kabupaten/kota (Satuan Komoditas), 2025*.
<https://www.bps.go.id/id/statistics-table/2/MjA5NCMy/rata-rata-konsumsi-perkapita-seminggu-menurut-kelompok-padi-padian-per-kabupaten-kota.html>

Chen, Z., Theppawong, A., Sangsawad, P., Fang, J., Ye, H., Deng, S., Yang, M.,
Gao, J., & Kraithong, S. (2025). Bioactive compounds in colored Rice:
Exploring natural agents for Cancer prevention in vitro and rodent model
studies. Dalam *Journal of Functional Foods* (Vol. 129). Elsevier Ltd.
<https://doi.org/10.1016/j.jff.2025.106875>

Chima, J. U., & Fasuan, T. O. (2021). Symbiotic and adverse interplay of
hypogeal germination periods on brown rice (*Oryza sativa*): nutrient and
non-nutrient characteristics. *Food Production, Processing and Nutrition*,
3(1). <https://doi.org/10.1186/s43014-021-00078-6>

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.

- Dalam *Journal of Food Science* (Vol. 89, Nomor 1, hlm. 8–32). John Wiley and Sons Inc. <https://doi.org/10.1111/1750-3841.16832>
- Chinma, C. E., Anuonye, J. C., Simon, O. C., Ohiare, R. O., & Danbaba, N. (2015). Effect of germination on the physicochemical and antioxidant and characteristics of rice flour from three rice varieties from Nigeria. *Food Chemistry*, 185, 454–458. <https://doi.org/10.1016/j.foodchem.2015.04.010>
- Cho, D. H., & Lim, S. T. (2016). Germinated brown rice and its bio-functional compounds. Dalam *Food Chemistry* (Vol. 196, hlm. 259–271). Elsevier Ltd. <https://doi.org/10.1016/j.foodchem.2015.09.025>
- Chung, S. I., Lo, L. M. P., & Kang, M. Y. (2016). Effect of germination on the antioxidant capacity of pigmented rice (*Oryza sativa* L. cv. superjami and superhongmi). *Food Science and Technology Research*, 22(3), 387–394. <https://doi.org/10.3136/fstr.22.387>
- Colton, T. (1974). *Statistic in Medicine* (1st ed.). Little, Brown and Company.
- Corbineau, F. (2022). Oxygen, a key signalling factor in the control of seed germination and dormancy. Dalam *Seed Science Research* (Vol. 32, Nomor 3, hlm. 126–136). Cambridge University Press. <https://doi.org/10.1017/S096025852200006X>
- Cosme, F., Aires, A., Pinto, T., Oliveira, I., Vilela, A., & Gonçalves, B. (2025). A Comprehensive Review of Bioactive Tannins in Foods and Beverages: Functional Properties, Health Benefits, and Sensory Qualities. Dalam *Molecules* (Vol. 30, Nomor 4). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/molecules30040800>
- Das, M., Dash, U., Mahanand, S. S., Nayak, P. K., & Kesavan, R. K. (2023). Black rice: A comprehensive review on its bioactive compounds, potential health benefits and food applications. Dalam *Food Chemistry Advances* (Vol. 3). Elsevier Ltd. <https://doi.org/10.1016/j.focha.2023.100462>
- Das, S., Kumari, T., Babu, S., C, N., Kumar, S., & Deka, S. C. (2025). Bioactive compounds, functional properties, health benefits, and food applications of black rice: a comprehensive review. Dalam *Food Chemistry Advances* (Vol. 7). Elsevier Ltd. <https://doi.org/10.1016/j.focha.2025.101028>

- Davies, N. T., & Reid, H. (1979). An evaluation of the phytate, zinc, copper, iron and manganese contents of, and Zn availability from, soya-based textured-vegetable-protein meat-substitutes or meat-extendors. *British Journal of Nutrition*, 41(3), 579–589. <https://doi.org/10.1079/bjn19790073>
- De Garmo, E. P., Sullivan, W. G., & Canada, J. R. (1984). *Engineering Economy* (7th ed.). Macmillan.
- 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>
- do Nascimento, L. Á., Abhilasha, A., Singh, J., Elias, M. C., & Colussi, R. (2022). Rice Germination and Its Impact on Technological and Nutritional Properties: A Review. Dalam *Rice Science* (Vol. 29, Nomor 3, hlm. 201–215). Elsevier B.V. <https://doi.org/10.1016/j.rsci.2022.01.009>
- Donata, V. C. (2024). *POTENSI ANTIDIABETIK BERAS HITAM GERMINASI VARIETAS CEMPO IRENG PADA MODEL IN VIVO*. Universitas Gadjah Mada.
- Dwiningsih, Y., & Alkahtani, J. (2023). *Potential of Pigmented Rice Variety Cempo Ireng in Rice Breeding Program for Improving Food Sustainability*. <https://doi.org/10.20944/preprints202302.0039.v1>
- Errico, S., Moggio, M., Diano, N., Portaccio, M., & Lepore, M. (2023). Different experimental approaches for Fourier-transform infrared spectroscopy applications in biology and biotechnology: A selected choice of representative results. Dalam *Biotechnology and Applied Biochemistry* (Vol. 70, Nomor 3, hlm. 937–961). John Wiley and Sons Inc. <https://doi.org/10.1002/bab.2411>
- Feizollahi, E., Mirmahdi, R. S., Zoghi, A., Zijlstra, R. T., Roopesh, M. S., & Vasanthan, T. (2021). Review of the beneficial and anti-nutritional qualities of phytic acid, and procedures for removing it from food products. *Food Research International*, 143. <https://doi.org/10.1016/j.foodres.2021.110284>
- Fukushima, A., Uchino, G., Akabane, T., Aiseki, A., Perera, I., & Hirotsu, N. (2021). Phytic acid in brown rice can be reduced by increasing soaking temperature. *Foods*, 10(1). <https://doi.org/10.3390/foods10010023>

- Gogoi, P., Sharma, P., Goudar, G., Mahajan, A., Dutta, H., Sasikumar, R., Ananthan, R., Singh, M., Nagaraju, M., & Longvah, T. (2025). Nutritional profile and mineral bioaccessibility of pigmented rice landraces. *Journal of Food Measurement and Characterization*, 19(2), 1513–1530.
<https://doi.org/10.1007/s11694-024-03094-5>
- Gul, K., Yousuf, B., Singh, A. K., Singh, P., & Wani, A. A. (2015). Rice bran: Nutritional values and its emerging potential for development of functional food - A review. Dalam *Bioactive Carbohydrates and Dietary Fibre* (Vol. 6, Nomor 1, hlm. 24–30). Elsevier Ltd.
<https://doi.org/10.1016/j.bcdf.2015.06.002>
- Gunajaya, A. (2025). *POTENSI BERAS HITAM GERMINASI VARIETAS CEMPO IRENG SEBAGAI AGEN ANTIHIPERKOLESTEROL PADA MODEL IN VIVO*. Universitas Gadjah Mada.
- Guo, J., Bian, Y. Y., Zhu, K. X., Guo, X. N., Peng, W., & Zhou, H. M. (2015). Effect of Steam Flash Explosion Pretreatment on Phytate Degradation of Wheat Bran. *Food and Bioprocess Technology*, 8(7), 1552–1560.
<https://doi.org/10.1007/s11947-015-1517-9>
- Guzmán-Ortiz, F. A., Castro-Rosas, J., Gómez-Aldapa, C. A., Mora-Escobedo, R., Rojas-León, A., Rodríguez-Marín, M. L., Falfán-Cortés, R. N., & Román-Gutiérrez, A. D. (2019). Enzyme activity during germination of different cereals: A review. Dalam *Food Reviews International* (Vol. 35, Nomor 3, hlm. 177–200). Taylor and Francis Inc.
<https://doi.org/10.1080/87559129.2018.1514623>
- Hamida, M. (2025). *Evaluasi Profil Fenolik dan Aktivitas Antioksidan pada Germinasi Beras Pecah Kulit Varietas IR-64 dan Cempo Ireng*. Universitas Gadjah Mada.
- Hartati, F. K., & Andryanto. (2022). Black Rice Extract Induced Apoptosis and Cell Cycle Arrest on Human Cancer Cell Lines. *Current Research in Nutrition and Food Science*, 10(3), 971–979.
<https://doi.org/10.12944/CRNFSJ.10.3.14>
- Hartati, F. K., Widjanarko, S. B., Widyaningsih, T. D., & Rifa'i, M. (2017). Anti-Inflammatory evaluation of black rice extract inhibits TNF- α , IFN- γ and IL-6 cytokines produced by immunocompetent cells. *Food and Agricultural*

- Immunology*, 28(6), 1116–1125.
<https://doi.org/10.1080/09540105.2017.1332006>
- He, D., & Yang, P. (2013). Proteomics of rice seed germination. Dalam *Frontiers in Plant Science* (Vol. 4, Nomor JUL). Frontiers Research Foundation.
<https://doi.org/10.3389/fpls.2013.00246>
- He, Z., Honeycutt, C. W., Zhang, T., & Bertsch, P. M. (2006). Preparation and FT–IR Characterization of Metal Phytate Compounds. *Journal of Environmental Quality*, 35(4), 1319–1328.
<https://doi.org/10.2134/jeq2006.0008>
- Hidalgo, A., Tumbas Šaponjac, V., Četković, G., Šeregelj, V., Čanadanović-Brunet, J., Chiosa, D., & Brandolini, A. (2019). Antioxidant properties and heat damage of water biscuits enriched with sprouted wheat and barley. *LWT*, 114. <https://doi.org/10.1016/j.lwt.2019.108423>
- Hu, X. W., Wang, Y. R., & Wu, Y. P. (2009). Effects of the pericarp on imbibition, seed germination, and seedling establishment in seeds of *Hedysarum scoparium* Fisch. et Mey. *Ecological Research*, 24(3), 559–564.
<https://doi.org/10.1007/s11284-008-0524-y>
- Hu, Z. (2025). Changes of Phenolic Profiles and Antioxidant Activity in Pigment Rough and Brown Rice (*Oryza sativa* L.) During Germination. *Current Research in Nutrition and Food Science*, 13(1), 172–184.
<https://doi.org/10.12944/CRNFSJ.13.1.11>
- Ibrahim, A., Bashir, M., & Garba, Z. M. (2021). Aminuetal2021. *Dutse Journal of Pure and Applied Sciences (DUJOPAS)*, 7, 67–75.
- Ito, V. C., & Lacerda, L. G. (2019). Black rice (*Oryza sativa* L.): A review of its historical aspects, chemical composition, nutritional and functional properties, and applications and processing technologies. Dalam *Food Chemistry* (Vol. 301). Elsevier Ltd.
<https://doi.org/10.1016/j.foodchem.2019.125304>
- Iwai, T., Takahashi, M., Oda, K., Terada, Y., & Yoshida, K. T. (2012). Dynamic changes in the distribution of minerals in relation to phytic acid accumulation during rice seed development. *Plant Physiology*, 160(4), 2007–2014. <https://doi.org/10.1104/pp.112.206573>

- Johnston, C., Leong, S. Y., Teape, C., Liesaputra, V., & Oey, I. (2024). Low-intensity pulsed electric field processing prior to germination improves in vitro digestibility of faba bean (*Vicia faba* L.) flour and its derived products: A case study on legume-enriched wheat bread. *Food Chemistry*, 449. <https://doi.org/10.1016/j.foodchem.2024.139321>
- Julia, C. C., Rose, T. J., Pariasca-Tanaka, J., Jeong, K., Matsuda, T., & Wissuwa, M. (2018). Phosphorus uptake commences at the earliest stages of seedling development in rice. *Journal of Experimental Botany*, 69(21), 5233–5240. <https://doi.org/10.1093/jxb/ery267>
- Kassegn, H. H., Hshe, B. G., Meresa, B. K., Berhe, M. H., & Tadesse, H. A. (2024). Germination process impact on proximate, minerals, and phytochemicals of malt barley, Abyssinian purple-colored barley and wheat. *Discover Food*, 4(1). <https://doi.org/10.1007/s44187-024-00195-4>
- Khan, F., Siddique, A. B., Shabala, S., Zhou, M., & Zhao, C. (2023). Phosphorus Plays Key Roles in Regulating Plants' Physiological Responses to Abiotic Stresses. Dalam *Plants* (Vol. 12, Nomor 15). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/plants12152861>
- Khandelwal, S., Udipi, S. A., & Ghugre, P. (2010). Polyphenols and tannins in Indian pulses: Effect of soaking, germination and pressure cooking. *Food Research International*, 43(2), 526–530. <https://doi.org/10.1016/j.foodres.2009.09.036>
- Kim, H. J., Han, J. A., Lim, S. T., & Cho, D. H. (2021). Effects of germination and roasting on physicochemical and sensory characteristics of brown rice for tea infusion. *Food Chemistry*, 350. <https://doi.org/10.1016/j.foodchem.2021.129240>
- Kulkarni, M. G., Sparg, S. G., & van Staden, J. (2005). Temp. *South African Journal of Botany*, 71(3 & 4), 349–353. [https://doi.org/https://doi.org/10.1016/S0254-6299\(15\)30108-3](https://doi.org/https://doi.org/10.1016/S0254-6299(15)30108-3)
- Kumar, A., Dash, G. K., Sahoo, S. K., Lal, M. K., Sahoo, U., Sah, R. P., Ngangkham, U., Kumar, S., Baig, M. J., Sharma, S., & Lenka, S. K. (2023). Phytic acid: a reservoir of phosphorus in seeds plays a dynamic role in plant and animal metabolism. Dalam *Phytochemistry Reviews* (Vol. 22,

Nomor 5, hlm. 1281–1304). Springer Science and Business Media B.V.
<https://doi.org/10.1007/s11101-023-09868-x>

- Kumar, A., Sahu, C., Panda, P. A., Biswal, M., Sah, R. P., Lal, M. K., Baig, M. J., Swain, P., Behera, L., Chattopadhyay, K., & Sharma, S. (2020). Phytic acid content may affect starch digestibility and glycemic index value of rice (*Oryza sativa* L.). *Journal of the Science of Food and Agriculture*, 100(4), 1598–1607. <https://doi.org/10.1002/jsfa.10168>
- Kumar, P., Patel, M., Oster, R. A., Yarlagadda, V., Ambrosetti, A., Assimios, D. G., & Mitchell, T. (2021). Dietary Oxalate Loading Impacts Monocyte Metabolism and Inflammatory Signaling in Humans. *Frontiers in Immunology*, 12. <https://doi.org/10.3389/fimmu.2021.617508>
- Kusman, H., Sudharmawan, A. A. K., & Fauzi, M. T. (2025). Potential Use of Invigoration Techniques to Improve Viability and Vigor of Soybean Seeds. *Jurnal Biologi Tropis*, 25(1), 843–851. <https://doi.org/10.29303/jbt.v25i1.8358>
- Lahhob, Q. R., Al-Sanaf, A. E., Mohammed, N. Y., Abbas, H. J., Ibrahim, Z. J., Najim, M. K., Malik, Z. A., Budaiwi, Z. K., Abdul-Jabbar, Z. H., & Kadham, M. J. (2023). Mineral and trace elements, dietary sources, biological effects, deficiency, and toxicity: a review. *Eurasian Chemical Communications*, 5(6), 536–555. <https://doi.org/10.22034/ecc.2023.381964.1594>
- Lei, X. G., & Porres, J. M. (2003). Phytase enzymology, applications, and biotechnology. Dalam *Biotechnology Letters* (Vol. 25).
- Lev, J., & Blahovec, J. (2018). Effect of I2/KI water solution to wheat seeds imbibition assessed by image analysis. *Agronomy Research*, 16(2), 492–499. <https://doi.org/10.15159/AR.18.047>
- 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, R., Lu, W., Gu, J., Li, X., Guo, C., & Xiao, K. (2011). Molecular characterization and functional analysis of OsPHY2, a phytase gene classified in histidine acid phosphatase type in rice (*Oryza sativa* L.).

African Journal of Biotechnology, 10(54), 11110–11123.

<http://www.academicjournals.org/AJB>

Li, R., Wang, Q., Zhao, G., Peng, H., Zhang, D., & Li, Z. (2022). Effects of germination time on phenolics, antioxidant capacity, in vitro phenolic bioaccessibility and starch digestibility in sorghum. *International Journal of Food Science and Technology*, 57(8), 5175–5185.

<https://doi.org/10.1111/ijfs.15827>

Lu, L., Shen, Q., Yu, S., Li, Z., Wu, Y., Liang, J., Liu, L., Wang, L., & Wang, C. (2025). Status of processing, nutritional and edible properties of rice after various degree of milling of brown rice. *Journal of Cereal Science*, 123.

<https://doi.org/10.1016/j.jcs.2025.104176>

Lu, L., Tian, S., Liao, H., Zhang, J., Yang, X., Labavitch, J. M., & Chen, W. (2013). Analysis of Metal Element Distributions in Rice (*Oryza sativa* L.) Seeds and Relocation during Germination Based on X-Ray Fluorescence Imaging of Zn, Fe, K, Ca, and Mn. *PLoS ONE*, 8(2).

<https://doi.org/10.1371/journal.pone.0057360>

Manwaring, H. R., Bligh, H. F. J., & Yadav, R. (2016). The challenges and opportunities associated with biofortification of pearl millet (*Pennisetum glaucum*) with elevated levels of grain iron and zinc. Dalam *Frontiers in Plant Science* (Vol. 7, Nomor DECEMBER2016). Frontiers Media S.A.

<https://doi.org/10.3389/fpls.2016.01944>

Marolt, G., Gričar, E., Pihlar, B., & Kolar, M. (2020). Complex Formation of Phytic Acid With Selected Monovalent and Divalent Metals. *Frontiers in Chemistry*, 8. <https://doi.org/10.3389/fchem.2020.582746>

Misiewicz, B., Mencer, D., Terzaghi, W., & VanWert, A. L. (2023). Analytical Methods for Oxalate Quantification: The Ubiquitous Organic Anion. Dalam *Molecules* (Vol. 28, Nomor 7). MDPI.

<https://doi.org/10.3390/molecules28073206>

Mohidem, N. A., Hashim, N., Shamsudin, R., & Man, H. C. (2022). Rice for Food Security: Revisiting Its Production, Diversity, Rice Milling Process and Nutrient Content. Dalam *Agriculture (Switzerland)* (Vol. 12, Nomor 6). MDPI.

<https://doi.org/10.3390/agriculture12060741>

- 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>
- Muslimov, N., Dalabaev, A., Ospanov, A., Sadibaev, A., & Moldakarimov, A. (t.t.). *CHANGES IN THE CARBOHYDRATE-AMYLASE COMPLEX GERMINATION OF CEREAL CROPS*.
- Nashrurrokhman, M., Sayekti, P. R., Safitri, A. Y. U., Purwestri, Y. A., & Pratiwi, R. (2019). Macronutrient and mineral contents of five local black rice (*Oryza sativa*) cultivars in Indonesia. *Biodiversitas*, 20(12), 3647–3653. <https://doi.org/10.13057/biodiv/d201225>
- Naz, T., Sharif, M. K., Shukat, R., & Israr, B. (2025). Characterizing germination effects on nutrient and anti-nutrient profiles in cereal-based protein-enriched supplement. *Journal of Food Measurement and Characterization*, 19(4), 2957–2969. <https://doi.org/10.1007/s11694-025-03158-0>
- Nazir, F., Zahid, H., Riaz, M., Mushtaq, Y., Amjad, N., Iqbal, H., Majeed, M. R., Kousar, S., & Mudassir, M. A. (2025). The impact of germination time on nutritional and antioxidant properties of selected cereals. *Cereal Research Communications*, 53(4), 2491–2504. <https://doi.org/10.1007/s42976-025-00670-3>
- Nissar, N., Wani, S. M., Hameed, O. Bin, Wani, T. A., & Ahmad, M. (2017). Influence of paddy (*Oryza sativa*) sprouting on antioxidant activity, nutritional and anti-nutritional properties. *Journal of Food Measurement and Characterization*, 11(4), 1844–1850. <https://doi.org/10.1007/s11694-017-9566-6>
- Nongpiur, R. C., Ali, A., Bagri, J., Upadhaya, S., Kumari, B., Barua, S., Pareek, A., & Chrungoo, N. K. (2025). Metabolite profiling of rice with different pericarp colours unveils new insights into nutrients and nutraceuticals content of aromatic black rice. *Journal of Food Measurement and Characterization*, 19(12), 10095–10110. <https://doi.org/10.1007/s11694-025-03643-6>

- Oliveira, M. E. A. S., Coimbra, P. P. S., Galdeano, M. C., Carvalho, C. W. P., & Takeiti, C. Y. (2022). How does germinated rice impact starch structure, products and nutritional evidences? – A review. Dalam *Trends in Food Science and Technology* (Vol. 122, hlm. 13–23). Elsevier Ltd.
<https://doi.org/10.1016/j.tifs.2022.02.015>
- Onyeka, U. E., Ukpong, E. S., Azudialu, C. B., Ndindeng, S. A., Senthilkumar, K., & Dimkpa, C. O. (2026). Unlocking the Nutritional Potential of Gamma Amino Butyric Acid (GABA) Rice: Towards a Sustainable Approach to Metabolic Disorder Remedies. *Food Science and Nutrition*, 14(2).
<https://doi.org/10.1002/fsn3.71284>
- 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>
- Owolabi, I. O., Saibandith, B., Wichienchot, S., & Yupanqui, C. T. (2018). Nutritional compositions, polyphenolic profiles and antioxidant properties of pigmented rice varieties and adlay seeds enhanced by soaking and germination conditions. *Functional Foods in Health and Disease*, 8(12), 561–578. <https://doi.org/10.31989/ffhd.v8i12.564>
- Ozogul, Y., Ucar, Y., Tadesse, E. E., Rathod, N., Kulawik, P., Trif, M., Esatbeyoglu, T., & Ozogul, F. (2025). Tannins for food preservation and human health: A review of current knowledge. Dalam *Applied Food Research* (Vol. 5, Nomor 1). Elsevier B.V.
<https://doi.org/10.1016/j.afres.2025.100738>
- Paul, B. N., Chanda, S., Das, S., Singh, P., Pandey, B. K., & Giri, S. S. (2014). *Mineral Assay in Atomic Absorption Spectroscopy* (Vol. 4).
- Perea-Brenes, A., Ruiz-Pino, N., Yubero, F., Garcia, J. L., Gonzalez-Elipe, A. R., Gomez-Ramirez, A., Prados, A., & Lopez-Santos, C. (2025). Ion Mobility and Segregation in Seed Surfaces Subjected to Cold Plasma Treatments. *Journal of Agricultural and Food Chemistry*, 73(11), 6486–6499.
<https://doi.org/10.1021/acs.jafc.4c09650>

- Perera, I., Seneweera, S., & Hirotsu, N. (2018). Manipulating the Phytic Acid Content of Rice Grain Toward Improving Micronutrient Bioavailability. Dalam *Rice* (Vol. 11, Nomor 1). Springer New York LLC.
<https://doi.org/10.1186/s12284-018-0200-y>
- Rahman, A. N. F., Asfar, M., Suwandi, N., & Amir, M. R. R. (2019). The Effect of Grain Germination to Improve Rice Quality. *IOP Conference Series: Earth and Environmental Science*, 355(1). <https://doi.org/10.1088/1755-1315/355/1/012110>
- Rahman, A. N. F., Tahir, M., Haddada, J., Bakri, R., Hambali, A., & Husnah, A. (2025). Assessing the Effects of Diverse Germination Methods on Red Rice Quality: A Physicochemical and Sensory Approach. *Current Research in Nutrition and Food Science*, 13(1), 258–270.
<https://doi.org/10.12944/CRNFSJ.13.1.17>
- Razzaque, M. S., & Wimalawansa, S. J. (2025). Minerals and Human Health: From Deficiency to Toxicity. Dalam *Nutrients* (Vol. 17, Nomor 3). Multidisciplinary Digital Publishing Institute (MDPI).
<https://doi.org/10.3390/nu17030454>
- Rego, C. H. Q., Cicero, S. M., Silva, F. F., & Gomes Junior, F. G. (2023). Morphology and germination of *Vigna unguiculata* (L.) Walp. seeds. *Journal of Seed Science*, 45. <https://doi.org/10.1590/2317-1545v45259022>
- Reza, H. M., Gias, Z. T., Islam, P., Sabnam, S., Jain, P., Hossain, M. H., & Alam, M. A. (2015). HPLC-DAD system-based phenolic content analysis and in vitro antioxidant activities of rice bran obtained from aush dhan (*Oryza sativa*) of Bangladesh. *Journal of Food Biochemistry*, 39(4), 462–470.
<https://doi.org/10.1111/jfbc.12154>
- Sakai, H., Iwai, T., Matsubara, C., Usui, Y., Okamura, M., Yatou, O., Terada, Y., Aoki, N., Nishida, S., & Yoshida, K. T. (2015). A decrease in phytic acid content substantially affects the distribution of mineral elements within rice seeds. *Plant Science*, 238, 170–177.
<https://doi.org/10.1016/j.plantsci.2015.06.006>
- Salgado, N., Silva, M. A., Figueira, M. E., Costa, H. S., & Albuquerque, T. G. (2023). Oxalate in Foods: Extraction Conditions, Analytical Methods, Occurrence, and Health Implications. Dalam *Foods* (Vol. 12, Nomor 17).

Multidisciplinary Digital Publishing Institute (MDPI).
<https://doi.org/10.3390/foods12173201>

Samyot, D., Das, A. B., & Deka, S. C. (2017). Pigmented rice a potential source of bioactive compounds: a review. Dalam *International Journal of Food Science and Technology* (Vol. 52, Nomor 5, hlm. 1073–1081). Blackwell Publishing Ltd. <https://doi.org/10.1111/ijfs.13378>

Sangma, H. C. R., & Parameshwari, S. (2024). Analysis of Proximate, Functional, and Mineral Composition in Processed Black Rice (*Oryza sativa* L. indica) Flours: A Comparative Exploration. *Journal of Natural Remedies*, 24(4), 851–860. <https://doi.org/10.18311/jnr/2024/35735>

Sardarodiyani, M., & Ataye Salehi, E. (2016). *Bioactive phytochemicals in rice bran: Processing and functional properties*. <https://www.researchgate.net/publication/307038271>

Serna, J., & Bergwitz, C. (2020). Importance of dietary phosphorus for bone metabolism and healthy aging. Dalam *Nutrients* (Vol. 12, Nomor 10, hlm. 1–43). MDPI AG. <https://doi.org/10.3390/nu12103001>

Shao, Y., Hu, Z., Yu, Y., Mou, R., Zhu, Z., & Beta, T. (2018). Phenolic acids, anthocyanins, proanthocyanidins, antioxidant activity, minerals and their correlations in non-pigmented, red, and black rice. *Food Chemistry*, 239, 733–741. <https://doi.org/10.1016/j.foodchem.2017.07.009>

Sharma, K., Kumar, V., Kaur, J., Tanwar, B., Goyal, A., Sharma, R., Gat, Y., & Kumar, A. (2021). Health effects, sources, utilization and safety of tannins: a critical review. Dalam *Toxin Reviews* (Vol. 40, Nomor 4, hlm. 432–444). Taylor and Francis Ltd. <https://doi.org/10.1080/15569543.2019.1662813>

Sharma, S., AnandKumar, L. H. D., Tyagi, A., Muthumilarasan, M., Kumar, K., & Gaikwad, K. (2022). An insight into phytic acid biosynthesis and its reduction strategies to improve mineral bioavailability. Dalam *Nucleus (India)* (Vol. 65, Nomor 2, hlm. 255–267). Springer. <https://doi.org/10.1007/s13237-021-00371-2>

Shrestha, J., Kandel, M., Subedi, S., & Shah, K. K. (2020). Role of nutrients in rice (*Oryza sativa* L.): A review. *Agrica*, 9(1), 53. <https://doi.org/10.5958/2394-448x.2020.00008.5>

- Singh, A., Sharma, S., Singh, B., Sharma, S., & Singh, B. (2018). Germination behaviour, physico-nutritional properties, and diastase activity of brown rice influenced by germination time and temperature. *Acta Alimentaria*, 47(1), 70–79. <https://doi.org/10.1556/066.2018.47.1.9>
- Stuart, Barbara. (2004). *Infrared spectroscopy : fundamentals and applications*. J. Wiley.
- Subroto, E., Indiarto, R., & Andoyo, R. (2023). Bioavailability of iron and its potential to improve the immune system and ward off COVID-19: a review. Dalam *Food Research* (Vol. 7, Nomor 1, hlm. 76–92). Rynnye Lyan Resources. [https://doi.org/10.26656/fr.2017.7\(1\).701](https://doi.org/10.26656/fr.2017.7(1).701)
- Suryanti, V., Riyatun, Suharyana, Sutarno, & Saputra, O. A. (2020). Antioxidant activity and compound constituents of gamma-irradiated black rice (*Oryza sativa* L.) var. cempo ireng indigenous of Indonesia. *Biodiversitas*, 21(9), 4205–4212. <https://doi.org/10.13057/biodiv/d210935>
- Tang, Y., Cai, W., & Xu, B. (2016). From rice bag to table: Fate of phenolic chemical compositions and antioxidant activities in waxy and non-waxy black rice during home cooking. *Food Chemistry*, 191, 81–90. <https://doi.org/10.1016/j.foodchem.2015.02.001>
- Thanuja, B., & Parimalavalli, R. (2018). Issue: 2; February. *International Journal of Health Sciences & Research* (www.ijhsr.org), 8, 241. www.ijhsr.org
- Thilavech, T., Suantawee, T., Chusak, C., Suklaew, P. O., & Adisakwattana, S. (2025). Black rice (*Oryza sativa* L.) and its anthocyanins: mechanisms, food applications, and clinical insights for postprandial glycemic and lipid regulation. Dalam *Food Production, Processing and Nutrition* (Vol. 7, Nomor 1). BioMed Central Ltd. <https://doi.org/10.1186/s43014-024-00288-8>
- Ti, H., Zhang, R., Zhang, M., Li, Q., Wei, Z., Zhang, Y., Tang, X., Deng, Y., Liu, L., & Ma, Y. (2014). Dynamic changes in the free and bound phenolic compounds and antioxidant activity of brown rice at different germination stages. *Food Chemistry*, 161, 337–344. <https://doi.org/10.1016/j.foodchem.2014.04.024>

- Tian, B., Xie, B., Shi, J., Wu, J., Cai, Y., Xu, T., Xue, S., & Deng, Q. (2010). Physicochemical changes of oat seeds during germination. *Food Chemistry*, 119(3), 1195–1200. <https://doi.org/10.1016/j.foodchem.2009.08.035>
- Tuan, P. A., Kumar, R., Rehal, P. K., Toora, P. K., & Ayele, B. T. (2018). Molecular mechanisms underlying abscisic acid/gibberellin balance in the control of seed dormancy and germination in cereals. Dalam *Frontiers in Plant Science* (Vol. 9). Frontiers Media S.A. <https://doi.org/10.3389/fpls.2018.00668>
- Ukpong, E. S., Okpalanma, E. F., & Ezegebe, C. C. (2022). Effects of milling, germination durations and germination temperatures on bioactive compounds and nutritional composition of FARO 57 brown rice cultivar. *Journal of Food Chemistry and Nanotechnology*, 8(4), 181–191. <https://doi.org/10.17756/jfcn.2022-139>
- Veni, B. K., Raja, D. S., Tushara, M., Suneetha, Y., & Mrudhula, K. A. (2025). Nutritional and cooking quality superiority of black rice genotype BPT 2841 with enhanced lysine content. *Scientific Reports*, 15(1). <https://doi.org/10.1038/s41598-025-00440-5>
- Verma, D. K., & Srivastav, P. P. (2020). Bioactive compounds of rice (*Oryza sativa* L.): Review on paradigm and its potential benefit in human health. Dalam *Trends in Food Science and Technology* (Vol. 97, hlm. 355–365). Elsevier Ltd. <https://doi.org/10.1016/j.tifs.2020.01.007>
- Wang, J., Ma, H., & Wang, S. (2019). Application of ultrasound, microwaves, and magnetic fields techniques in the germination of cereals. Dalam *Food Science and Technology Research* (Vol. 25, Nomor 4, hlm. 489–497). Japanese Society for Food Science and Technology. <https://doi.org/10.3136/fstr.25.489>
- Wanyo, P., Huaيسان, K., & Chamsai, T. (2020). Oxalate contents of Thai rice paddy herbs (*L. aromatica* and *L. geoffrayi*) are affected by drying method and changes after cooking. *SN Applied Sciences*, 2(5). <https://doi.org/10.1007/s42452-020-2703-6>
- Wintersohle, C., Arnold, S. J., Geis, H. M., Keutgen, F., Etzbach, L., & Schweiggert-Weisz, U. (2024). Impact of short-term germination on dehulling efficiency, enzymatic activities, and chemical composition of

- mung bean seeds (*Vigna radiata* L.). *Future Foods*, 10.
<https://doi.org/10.1016/j.fufo.2024.100416>
- Wu, N. N., Li, R., Li, Z. J., & Tan, B. (2022). Effect of germination in the form of paddy rice and brown rice on their phytic acid, GABA, γ -oryzanol, phenolics, flavonoids and antioxidant capacity. *Food Research International*, 159. <https://doi.org/10.1016/j.foodres.2022.111603>
- Wu, X., Tan, M., Zhu, Y., Duan, H., Ramaswamy, H. S., Bai, W., & Wang, C. (2023). The influence of high pressure processing and germination on anti-nutrients contents, in vitro amino acid release and mineral digestibility of soybeans. *Journal of Food Composition and Analysis*, 115. <https://doi.org/10.1016/j.jfca.2022.104953>
- Yılmaz Tuncel, N., Polat Kaya, H., Sakarya, F. B., Andaç, A. E., Korkmaz, F., Ozkan, G., Tuncel, N. B., & Capanoglu, E. (2025). The Effect of Germination on Antinutritional Components, In Vitro Starch and Protein Digestibility, Content, and Bioaccessibility of Phenolics and Antioxidants of Some Pulses. *Food Science and Nutrition*, 13(5). <https://doi.org/10.1002/fsn3.70103>
- Zhang, G., Xu, Z., Gao, Y., Huang, X., Zou, Y., & Yang, T. (2015). Effects of germination on the nutritional properties, phenolic profiles, and antioxidant activities of buckwheat. *Journal of Food Science*, 80(5), H1111–H1119. <https://doi.org/10.1111/1750-3841.12830>
- Zhang, M. W., Guo, B. J., & Peng, Z. M. (2005). Genetic effects on grain characteristics of indica black rice and their uses on indirect selections for some mineral element contents in grains. *Genetic Resources and Crop Evolution*, 52(8), 1121–1128. <https://doi.org/10.1007/s10722-004-6114-0>
- Zhu, L., Xie, Q., Qin, D., He, Y., Yuan, H., Mao, Y., Pan, Z., Li, G., & Xia, X. (2025). Germination-Induced Biofortification: Improving Nutritional Efficacy, Physicochemical Properties, and In Vitro Digestibility of Black Rice Flour. *Foods*, 14(16). <https://doi.org/10.3390/foods14162912>