



DAFTAR PUSTAKA

- Aqiyah, H., Ulya, F., 2025. Pengaruh konsentrasi sari daun pepaya gantung sebagai sumber enzim papain terhadap proses dekafeinasi kopi liberika. *J. Pertan. Cemara* 22, 62–70.
- Baehaki, A., Lestari, S.D., Romadhoni, A.R., 2015. Hidrolisis protein ikan patin menggunakan enzim papain dan aktivitas antioksidan hidrolisatnya. *Pengolah. Has. Perikan. Indones.* 18, 230–239.
- Barbehenn, R. V., 1995. Measurement of protein in whole plant samples with ninhydrin. *J. Sci. Food Agric.* 69, 353–359.
- Borrajao, P., Pateiro, M., Gagaoua, M., Franco, D., Zhang, W., Lorenzo, M., 2020. Evaluation of the antioxidant and antimicrobial activities of porcine liver protein hydrolysates obtained using alcalase, bromelain, and papain. *Appl. Sci.* 10(7).
- Çakmak, M., Karatas, F., Özer, D., 2024. Investigation of Amino Acids Content of Different Poultry Eggs Types. *MW J. Sci.* 1, 10–20.
- Czelej, M., Garbacz, K., Czernecki, T., Rachwał, K., Wawrzykowski, J., Waśko, A., 2025. Whey Protein Enzymatic Breakdown: Synthesis, Analysis, and Discovery of New Biologically Active Peptides in Papain-Derived Hydrolysates. *Molecules* 30, 1–15.
- Di Bernardini, R., Harnedy, P., Bolton, D., Kerry, J., O'Neill, E., Mullen, A.M., Hayes, M., 2011. Antioxidant and antimicrobial peptidic hydrolysates from muscle protein sources and by-products. *Food Chem.* 124, 1296–1307.
- Eirry Sawitri, M., Prasetyawan, S., 2019. Studi Interaksi Kompleks Inulin dan Fraksi Kasein Melalui Analisis In-Silico dan Molecular Docking Sebagai Dasar Pengembangan Prebiotic Fermented Milk. *J. Ilmu dan Teknol. Has. Ternak* 19, 11–19.
- El-Beltagi, H.S., Ibrahim, E., Almutairi, H.H., Alhajri, A.S., Shehata, W.F., Mansour, H., Sitothy, M., Osman, A., 2025. Anticancer and antioxidant activities of papain-hydrolyzed α -lactalbumin. *Appl. Ecol. Environ. Res.* 23, 2291–2305.
- Elias, R.J., Kellerby, S.S., Decker, E.A., 2008. Antioxidant activity of proteins and peptides. *Crit. Rev. Food Sci. Nutr.* 48, 430–441.
- Farida, T., Suhartono, Ratna, K.I., 2023. Pengaruh Variasi Komposisi Susu Skim Terhadap Kadar Asam Amino pada Yogurt Sari Jagung Manis (*Zea mays L. saccharata*). *JRSKT - J. Ris. Sains dan Kim. Terap.* 9, 33–44.
- Friedman, M., 2004. Applications of the Ninhydrin Reaction for Analysis of



Amino Acids, Peptides, and Proteins to Agricultural and Biomedical Sciences. *J. Agric. Food Chem.* 52, 385–406.

Garmidolova, A., Desseva, I., Mihaylova, D., Fidan, H., Terziyska, M., Pavlov, A., 2022. Papain Hydrolysates of Lupin Proteins with Antioxidant, Antimicrobial, and Acetylcholinesterase Inhibitory Activities. *Appl. Sci.* 12.

Gulcin, İ., Alwasel, S.H., 2023. DPPH Radical Scavenging Assay. *Processes* 11.

He, R., Girgih, A.T., Malomo, S.A., Ju, X., Aluko, R.E., 2013. Antioxidant activities of enzymatic rapeseed protein hydrolysates and the membrane ultrafiltration fractions. *J. Funct. Foods* 5, 219–227.

Horax, R., Vallecios, M.S., Hettiarachchy, N., Osorio, L.F., Chen, P., 2017. Solubility, functional properties, ACE-I inhibitory and DPPH scavenging activities of Alcalase hydrolysed soy protein hydrolysates. *Int. J. Food Sci. Technol.* 52, 196–204.

Islam, M.S., Hongxin, W., Admassu, H., Noman, A., Ma, C., An wei, F., 2021. Degree of hydrolysis, functional and antioxidant properties of protein hydrolysates from Grass Turtle (*Chinemys reevesii*) as influenced by enzymatic hydrolysis conditions. *Food Sci. Nutr.* 9, 4031–4047.

Jeong, S., Jeon, Y., Mun, J., Jeong, S.M., Liang, H., Chung, K., Yi, P.I., An, B.S., Seo, S., 2023. Ninhydrin Loaded Microcapsules for Detection of Natural Free Amino Acid. *Chemosens.* 2023, Vol. 11, Page 49 11, 49.

Juwita, R., Tyas, E., Sejati, D.A.P., Simanjuntak, A.V.S., 2022. Inovasi Ekstrak Pepaya sebagai Enzim Papain. *J. MIPA dan Pembelajarannya* 2, 300–306.

Kurniawan, K. (Kurniawan), Lestari, S. (Susi), R. J., S.H., 2012. Hidrolisis Protein Tinta Cumi-cumi (*Loligo SP*) Dengan Enzim Papain. *Fishtech* 1, 41–54.

Liu, F.F., Li, Y.Q., Wang, C.Y., Liang, Y., Zhao, X.Z., He, J.X., Mo, H.Z., 2022. Physicochemical, functional and antioxidant properties of mung bean protein enzymatic hydrolysates. *Food Chem.* 393, 133397.

Minj, S., Anand, S., 2020. Whey Proteins and Its Derivatives: Bioactivity, Functionality, and Current Applications. *Dairy* 1, 233–258.

Nath, A., Ahmad, A.S., Amankwaa, A., Csehi, B., Mednyánszky, Z., Szerdahelyi, E., Tóth, A., Tormási, J., Truong, D.H., Abrankó, L., Koris, A., 2022. Hydrolysis of Soybean Milk Protein by Papain: Antioxidant, Anti-Angiotensin, Antigenic and Digestibility Perspectives. *Bioengineering* 9.



- Pereiz, Z., Chuchita, C., Kumalasari, M.R., Nafisah, Z., 2023. Analisis aspartam dengan metode spektrofotometri uv-visible serta optimasi konsentrasi ninhidrin dan aplikasinya untuk penentuan kandungan dalam minuman energi. *J. Indones. Sos. Teknol.* 4, 508.
- Power, O., Jakeman, P., Fitzgerald, R.J., 2013. Antioxidative peptides: enzymatic production, in vitro and in vivo antioxidant activity and potential applications of milk-derived antioxidative peptides. *Amino Acids* 44, 797–820.
- Puspawati, N.M., Dewi, P.P., Bogoriani, N.W., Ariati, N.K., 2020. Produksi Hidrolisat Protein Antioksidan Melalui Hidrolisis Enzimatik Protein Kulit Ayam Broiler Dengan Enzim Papain. *J. Kim.* 14, 206.
- Raja Nhari, R.M.H., Che Man, Y., Ismail, A., Anuar, N., 2011. Chemical and functional properties of bovine and porcine skin gelatin. *Int. Food Res. J.* 817, 813–817.
- Samaranayaka, A.G.P., Li-Chan, E.C.Y., 2011. Food-derived peptidic antioxidants: A review of their production, assessment, and potential applications. *J. Funct. Foods* 3, 229–254.
- Sathyadevi, P., Krishnamoorthy, P., Jayanthi, E., Butorac, R.R., Cowley, A.H., Dharmaraj, N., 2012. Studies on the effect of metal ions of hydrazone complexes on interaction with nucleic acids, bovine serum albumin and antioxidant properties. *Inorganica Chim. Acta* 384, 83–96.
- Shahidi, F., Zhong, Y., 2015. Measurement of antioxidant activity. *J. Funct. Foods* 18, 757–781.
- Shelkovernikov, V. V., Doroshenko, D.D., Kargapolova, I.Y., Kozlakov, P.A., Shestakov, N.A., Sotnikova, Y.S., 2025. Spectral-Luminescent Properties of Products of Interaction of Polyfluorinated Pyrazoline-Containing Pyrylium Dyes with Bovine Serum Albumin and Amino Acids. *Russ. J. Bioorganic Chem.* 51, 216–228.
- Sun, Q., Shen, H., Luo, Y., 2011. Antioxidant activity of hydrolysates and peptide fractions derived from porcine hemoglobin. *J. Food Sci. Technol.* 48, 53–60.
- Udenigwe, C.C., Aluko, R.E., 2011. Chemometric analysis of the amino acid requirements of antioxidant food protein Hydrolysates. *Int. J. Mol. Sci.* 12, 3148–3161.
- Wu, R.B., Wu, C.L., Liu, D., Yang, X.H., Huang, J.F., Zhang, J., Liao, B., He, H.L., Li, H., 2015. Overview of Antioxidant Peptides Derived from Marine Resources: The Sources, Characteristic, Purification, and Evaluation Methods. *Appl. Biochem. Biotechnol.* 176, 1815–1833.
- Yana, R., Permatasari, S., 2022. Pembuatan Isolat Papain Dari Getah Buah Pepaya Untuk Hidrolisis Protein Pada Pengembangan Metode



Penambahan Materi Praktikum Biokimia. J. Kedokt. dan Kesehat. Publ. Ilm. Fak. Kedokt. Univ. Sriwij. 9, 143–152.

Yang, S., Yang, F., Chi, Yuan, Chi, Yujie, 2025. Evaluating the liquid egg white freshness: Development, mechanistic analysis and application of a novel electrochemical method-based rapid detection technique. Chem. Eng. J. 503, 158183.

Zhao, C.C., Lu, J.K., Ameer, K., 2021. Effects of tofu whey powder on the quality attributes, isoflavones composition and antioxidant activity of wheat flour pan bread. Lwt 143.

Zhu, Z., Xu, Z., Li, Y., Fan, Y., Zhou, Y., Song, K., Meng, L., 2024. Antioxidant Function and Application of Plant-Derived Peptides. Antioxidants 13, 1–20.

Zou, T. Bin, He, T.P., Li, H. Bin, Tang, H.W., Xia, E.Q., 2016. The structure-activity relationship of the antioxidant peptides from natural proteins. Molecules 21, 1–14.