



UNIVERSITAS
GADJAH MADA

LEVEL EKSPRESI GEN GPX1 PADA *Saccharomyces cerevisiae* SETELAH PERLAKUAN EKSTRAK

DAUN BELUNTAS

(*Pluchea indica* L.)

CINTA ALIVIA ATHA, Dr. Fajar Sofyantoro, S.Si., M.Sc.

Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

PUSTAKA ACUAN

- Anam, C., & Agustini, T. W. (2014). Pengaruh pelarut yang berbeda pada ekstraksi spirulina platensis serbuk sebagai antioksidan dengan metode soxhletasi. *Jurnal Pengolahan dan Bioteknologi Hasil Perikanan*, 3(4), 106-112.
- Arsova-Sarafinovska, Z., Matevska, N., Eken, A., Petrovski, D., Banev, S., Dzikova, S., and Dimovski, A. J. (2009). Glutathione peroxidase 1 (GPX1) genetic polymorphism, erythrocyte GPX activity, and prostate cancer risk. *International urology and nephrology*, 41, 63-70.
- Aulia, S. L., Suwignyo, R. A., & Hasmeda, M. (2021). Optimasi Suhu Annealing untuk Amplifikasi Dna Padi Hasil Persilangan Varietas Tahan Terendam dengan Metode Polymerase Chain Reaction. *Sainmatika: Jurnal Ilmiah Matematika dan Ilmu Pengetahuan Alam*, 18(1), 44-54.
- Azasi, N. M. (2023). *Potensi Ekstrak Daun Beluntas (*Pluchea indica* (L.) Less.) Sebagai Bahan Alami Antipenuaan*. Skripsi. Fakultas Biologi, Universitas Gadjah Mada: Yogyakarta.
- Bai, K., W. Xu, J. Zhang, T. Kou, Y. Niu, X. Wan, L. Zhang, C. Wang, and T. Wang. (2016). Assessment of free radical scavenging activity of dimethylglycine sodium salt and its role in providing protection against lipopolysaccharide- induced oxidative stress in mice. *PLoS ONE*, 11 (5) : 1-17.
- Baracca, A., S. Gianluca, S. Giancarlo and L. Giorgio. (2003). Rhodamine 123 as a probe of mitochondrial membrane potential: Evaluation of proton flux through F0 during ATP synthesis. *Biochim. Biophys. Acta*, 1606(1-3): 137-146.
- Batubara, I., R. I. Astuti, M. E. Prastyo, A. Ilmiawati, M. Maeda, M. Suzuki, A. Hamamoto, and H. Takemori. (2020). The antiaging effect of active fractions and Ent-11 α -hydroxy-15-oxo-kaur-16-en-19-oic acid isolated from Adenostemma lavenia (L.) O. Kuntze at the cellular level. *Antioxidants*, 9(719): 1-14.
- Belak, Z. R., T. Harkness, and C. H. Eskiw. (2018). A rapid, high-throughput method for determining chronological lifespan in budding yeast. *Journal of Biological Methods*, 5(4): 1-9.
- Bryant S, Manning DL. 1998. Isolation of messenger RNA. *Methods Mol Biol* 86: 61-64.



- Brigelius-Flohé, R., & Maiorino, M. (2013). Glutathione peroxidases. *Biochimica et Biophysica Acta (BBA)-General Subjects*, 1830(5), 3289-3303.
- Buapool, D., N. Mongkol, J. Chantimal, S. Roytrakul, E. Srisko, and K. Srisko. 2013. Molecular mechanism of anti-inflammatory activity of Pluchea indica leaves in macrophages RAW 264.7 and its action in animal models of inflammation. *Journal of Ethnopharmacology*, 146(2013): 495-504.
- Chandran, R., P. Thangaraj, S. Shanmugam, S. Thankarajan, and A. C. Karuppusamy. 2011. Antioksidant and anti-inflammatory potential of *Monochoria Vaginalis* (Burm. F.) C. Presl. : a wild edible plant. *Journal of Food Biochemistry*.
- Cheff, D. M., Cheng, Q., Guo, H., Travers, J., Klumpp-Thomas, C., Shen, M., ... & Hall, M. D. (2023). Development of an assay pipeline for the discovery of novel small molecule inhibitors of human glutathione peroxidases GPX1 and GPX4. *Redox Biology*, 102719.
- Chen, J.Y. Hu, and S.Q. Wang. 2012. The role of antioxidant in photoprotector: a critical review. *Journal of the American Academy of Dermatol.* 67(5): 1013-1024.
- Chiangnoon, R., W. Samee., P. Uttayarat, W. Jittachai, W. Ruksiriwanich, S. R. Sommano, S. Athikomkulchai, and C. Chittasupho. 2022. Phytochemical analysis, antioxidant, and wound healing activity of *Pluchea indica* L. (Less) branch extract nanoparticles. *Molecules*, 27(635): 1-21.
- Chu, Y., Lan, R. S., Huang, R., Feng, H., Kumar, R., Dayal, S., ... & Dai, D. F. (2020). Glutathione peroxidase-1 overexpression reduces oxidative stress, and improves pathology and proteome remodeling in the kidneys of old mice. *Aging Cell*, 19(6), e13154.
- Davalli, P., T. Mitic, A. Caporali, A. Lauriola, and D. D'Arca. 2016. ROS, cell senescence, and novel molecular mechanisms in aging and age-related diseases. *Oxidative Medicine and Cellular Longevity*, 2016: 1-18.
- Delazar, A., L. Nahar., S. Hamedeyaz, and S.D. Satyajit. 2012. Microwave-assisted extraction in natural products isolation natural products isolation, methods in molecular biology. *Springer Science*, New York. 864:215-218.
- Desjardins, P. and D. Conklin. 2010. NanoDrop microvolume quantitation of nucleic acids. *Journal of Visualized Experiments*. (45): 1–4. doi: 10.3791/2565.



- Djuanda S.R.S., Novianto E., Boediardja S.A, dan Jusman S.W.A. 2012. Peran stres oksidatif pada penuaan kulit secara intrinsik. *MDVI*. 39:127-33.
- Downey, Nick. 2014. Explaining Multiple Peaks in qPCR Melt Curve Analysis. *Idtdna*. 2014.
- Emerald, M., A. Emerald, L. Emerald, and V. Kumaret. 2016. Perspective of natural products in skincare. *Pharm Pharmacol Int J.*, 4(3): 339–341.
- Farrell RE. 2005. *RNA methodologies: A laboratory guide for isolation and characterization*. 3rd ed. Elsevier Academic Press, Burlington.
- Febrina, L., Rusli, R., & Mufliahah, F. (2015). Optimalisasi ekstraksi dan uji metabolit sekunder tumbuhan libo (*Ficus variegata Blume*). *Journal of Tropical Pharmacy and Chemistry*, 3(2), 74-81.
- Fedriana, V. 2019. *Ekspresi Gen Phytoene Synthase dan Lycopene-β-Cyclase Dalam Jalur Biosintesis Karoten Pada Lima Tahap Perkembangan Biji Beras Hitam (Oryza sativa L. 'Cempo Ireng')*. Skripsi. Universitas Gadjah Mada.
- Fitriah, F., Mappiratu, M., & Prismawiryanti, P. (2017). Uji aktivitas antibakteri ekstrak daun tanaman johar (*Cassia siamea Lamk.*) dari beberapa tingkat kepolaran pelarut. *KOVALEN: Jurnal Riset Kimia*, 3(3), 242-251.
- Fitriansyah, M. I. and R. B. Indradi. 2018. Review: profil fitokimia dan aktivitas farmakologi beluntas (*Pluchea indica L.*). *Farmaka*, 16(2): 337-346.
- Gallagher, S.R. 1989. Quantitation of DNA and RNA with absorption and fluorescence spectroscopy. In Ausubel, F. A., Brent, R., Kingston, R. E., Moore, D. D., Seidman, J. G., Smith, J. A., and K. Struhl. *Current Protocols in Molecular Biology*. John Wiley and Sons. New York.
- Ganceviciene, R., A. I. Liakou, A. Theodoridis, E. Makrantonaki, and C. C. Zouboulis. 2012. Skin anti-aging strategies. *Dermato-Endocrinology*, 4(3): 308-319.
- Handoyo, D., & Rudiretna, A. (2000). Prinsip umum dan pelaksanaan polymerase chain reaction (PCR)[general principles and implementation of polymerase chain reaction]. *Unitas*, 9(1), 17-29.
- Ibrahim, S. R. M., A. A. Bagalagel, R. M. Diri, A. O. Noor, H. T. Bakhsh, and G. A. Mohamed. 2022. Phytoconstituent and pharmacological activities of Indian



Camphorweed (*Pluchea indica*): a multi-potential medicinal plant of nutritional and ethnomedicinal importance. *Molecules*, 27(2383): 1- 49.

Ihsani, D. A., Arifin, A., & Fatoni, M. H. (2020). Klasifikasi DNA Microarray Menggunakan Principal Component Analysis (PCA) dan Artificial Neural Network (ANN). *Jurnal Teknik ITS (SINTA: 4, IF: 1.1815)*, 9(1), A124-A129.

Jami'ah, S. R., Ifaya, M., Pusmarani, J., & Nurhikma, E. (2018). Uji aktivitas antioksidan ekstrak metanol kulit pisang raja (*Musa paradisiaca sapientum*) dengan metode DPPH (2, 2-difenil-1-pikrilhidrazil). *Jurnal Mandala Pharmacon Indonesia*, 4(1), 33-38.

Karim, A.A., Azlan, A., Ismail, A., Hashim, P., Gani, S.S.A, Zainudin, B.H., Abdullah, N.A. 2014. Phenolic composition, antioxidant, anti-wrinkles and tyrosinase inhibitory activities of cocoa pod extract. *BMC Complement. Altern. Med.* 14: 381.

Kerns M.L, Chien A.L, Kang S. Skin aging. 2019. Dalam: Kang S, Amagai M, Bruckner AL, Enk AH, Margolis DJ, McMichael AJ, et al, editor. *Fitzpatrick's dermatology*. Edisi ke-9. New York: McGraw Hill. pp.1779-91.

Khawaja, A., Z. R. Belak, C. H. Eskiw, and T. A. A. Harkness. 2021. High Throughput Rapid Yeast chronological lifespan assay. *Yeast Protocols, Methods in Molecular Biology*, 2196: 229-233.

Korbie, D. J., & Mattick, J. S. (2008). Touchdown PCR for increased specificity and sensitivity in PCR amplification. *Nature protocols*, 3(9), 1452-1456.

Kuang, J., Yan, X., Genders, A. J., Granata, C., & Bishop, D.J. 2018. An overview of technical considerations when using quantitative real-time PCR analysis of gene expression in human exercise research. *PloS ONE*. 13 : 1-27.

Lachenmeier, D. W. 2008. Safety evaluation of topical applications of ethanol on the skin and inside the oral cavity. *Journal of Occupational Medicine and Toxicology*, 3(26): 1-16.

Lei, X. G., Zhu, J. H., Cheng, W. H., Bao, Y., Ho, Y. S., Reddi, A. R., ... & Arnér, E. S. (2016). Paradoxical roles of antioxidant enzymes: basic mechanisms and health implications. *Physiological reviews*, 96(1), 307-364.



- Leonard, E. 2018. *Pengujian Tingkat Ekspresi Gen CDKN2A Terhadap Penuaan Sel Pada Human Umbilical Cord Mesenchymal Stem Cells (hUCMSC) dan Human Bone Marrow Mesenchymal Stem Cells (hBMSC)*. Skripsi. Universitas Gadjah Mada.
- Liu, C., Yan, Q., Gao, C., Lin, L., & Wei, J. (2021). Study on antioxidant effect of recombinant glutathione peroxidase 1. *International Journal of Biological Macromolecules*, 170, 503-513.
- Livak, K. J. and T. D. Schmittgen. 2001. Analysis of relative gene expression data using real-time quantitative PCR and the 2- $\Delta\Delta CT$ method. *Methods*. 25(4): 402–408. doi: 10.1006/meth.2001.1262.
- López-Otín, C., Blasco, M. A., Partridge, L., Serrano, M., & Kroemer, G. (2013). The hallmarks of aging. *Cell*, 153(6), 1194-1217.
- Marianne., Lestari, D., Sukandar, EY., Kurniati, NF., Nasution, R. 2014. Antidiabetic Activity of Leaves Ethanol Chromolaena odorata (L.) R.M. King on Induced Male Mice with Alloxan Monohydrate. *Jurnal Natural*. 14 (1): 1-4 ISSN 1141- 8513.
- Marxen, Kai, Klaus Heinrich Vanselow, Sebastian Lippemeier, Ralf Hintze, Andreas Ruser, and Ulf-peter Hansen. 2007. "S7102080.Pdf." 2080–95
- Matvieieva, N., Drobot, K., Duplij, V., Ratushniak, Y., Shakhovsky, A., Kyrpa-Nesmian, T., Mickevičius, S., and Brindza, J. (2019). Flavonoid content and antioxidant activity of Artemisia vulgaris L. "hairy" roots. *Preparative Biochemistry and Biotechnology*, 49(1), 82–87.
- Molyneux, P. (2004). The use of the stable free radical diphenylpicrylhydrazyl (DPPH) for estimating antioxidant activity. *Songklanakarin J. sci. technol*, 26(2), 211-219.
- Nafisa, A. R., Sebastian, A., Wijayanti, P., Patigu, R. F., & Purwestri, Y. A. (2022). Optimasi Primer yang Menargetkan Gen OsAP2, OsERF3 dan OsEREFP2 Menggunakan qPCR. *Bioeksperimen: Jurnal Penelitian Biologi*, 8(1), 8-19.
- Nema, R.K., S. Mandal, and Satish, Y. 2009. Atioxidants: a review. *Journal of Chemical and Pharmaceutical Research* 1(1): 102-104.
- Noridayu, A. R., Y. F. Hii, A. Faridah, S. Khozirah, and N. Lajis. 2011. Antioxidant and antiacetylcholinesterase activities of Pluchea indica Less. *International Food Research Journal*, 18(3): 925-929.



- Nurulita, N.A., Elza, S., Irma, A., Fifi, R., dan Nina, N.D.U. 2019. Uji aktivitas antioksidan dan anti-aging body butter dengan bahan aktif ekstrak daun kelor. *Jurnal Ilmu Kefarmasian Indonesia*, 17(1): 1-8. OK
- Porta, Angela R & Enners Edward. 2012. Determining Annealing Temperatures for Polymerase Chain Reaction. *The American Biology Teacher*. 74 : 256 – 260.
- Pouillot, A., Polla, L.L., Tacchini, P., Neequaye, A., Polla, A., Polla, B., 2011. *Natural antioxidants and their effects on the skin, in Formulating*. Packaging, and Marketing of Natural Cosmetic Product, edited by N. Dayan and L. Kromidas. John Wiley & Sons. New York.
- Prastyo, M. E., R. I. Astuti, I. Batubara, A. T. Wahyudi. 2018. Bacillus sp. SAB E-41-derived extract shows antiaging properties via ctt1-mediated oxidative stress tolerance response in yeast *Schizosaccharomyces pombe*. *Asian Pacific Journal of Tropical Biomedicine*, 8(11): 533-539.
- Prastyo, M. E., R. I. Astuti, I. Batubara, H. Takagi, and A. T. Wahyudi. 2020. Chemical screening identifies an extract from marine *Pseudomonas* sp. -PTR-08 as an anti-aging agent that promotes fission yeast longevity by modulating the Pap1–ctt1+ pathway and the cell cycle. *Molecular Biology Reports*, (47): 33–43.
- Pratama, M.R.F., Suratno, S., & Mulyani, E. 2018. Profile of Thin-Layer Chromatography and UV-Vis Spectrophotometry of Akar Kuning Stem Extract (*Arcangelisia flava*). *Borneo Journal of Pharmacy*. 1(2):72-76.
- Pratiwi, E. (2010). Perbandingan metode maserasi, remaserasi, perkolasai dan reperkolasi dalam ekstraksi senyawa aktif Andrographolide dari tanaman sambiloto (*Andrographis paniculata* (Burm. f.) nees).
- Rapley R, Heptinstall J. 1998. UV spectrophotometric analysis of ribonucleic acids. In: Rapley R, Manning DL (eds.). 1998. Methods in molecular biology. Vol. 86. RNA: Isolation and characterization protocols. *Humana Press Inc.*, Totowa.
- Rajput, V. D., Harish, R. K. Singh, K. K. Verma, L. Sharma, F. R. Quiroz-Figueroa, M. Meena, V. S. Gour, T. Minkina, S. Sushkova, and S. Mandzhieva. 2021. Recent developments in enzymatic antioxidant defence mechanism in plants with special reference to abiotic stress. *Biology*, 10(267): 1-28.



Ramdan, S. R. K. (2024). Uji Aktivitas Antioksidan Seduhan Bunga Telang (*Clitoria ternatea* L) Dengan Metode DPPH. *Pharmacy Genius*, 3(01), 56-66.

Rochmah, W. and S. Awin. 2001. Tua dan proses menua. *Berkala Ilmu Kedokteran*, 33(4): 221-227.

Sani, R. N., Nisa, F. C., Andriani, R. D., & Maligan, J. M. (2014). Analisis Rendemen Dan Skrining Fitokimia Ekstrak Etanol Mikroalga Laut Tetraselmis chuii Yield Analysis and Phytochemical Screening Ethanol Extract of Marine Microalgae Tetraselmis chuii. *Jurnal Pangan dan Agroindustri*, 2(2), 121-126.

Saraswati, I. G., Suter, I. K., & Wiadnyani, A. (2021). Pengaruh Jenis Pelarut Dan Rasio Bahan Dengan Pelarut Pada Metode Ultrasonik Terhadap Aktivitas Antioksidan Ekstrak Daun Beluntas (Pluchea indica Less) The Effect of Type of Solvent and the Ratio of Material to the Solvent by the Ultrasonication Method. *Jurnal Ilmu Dan Teknologi Pangan*, 10(1), 24-35.

Schmittgen, T. D., & Livak, K. J. (2008). Analyzing real-time PCR data by the comparative CT method. *Nature protocols*, 3(6), 1101-1108.

Setiawati, W., Murtiningsih, R., Gunadi, N., & Rubiati, T. 2008. *Tumbuhan bahan pestisida nabati dan cara pembuatannya untuk pengendalian organisme pengganggu tumbuhan* (OPT).

Siswanto, Y. P., Merdekawati, F., Ernawati, E., Hardiana, A. T., & Kurniawan, E. (2019). Optimasi Suhu Annealing dan Konsentrasi Primer Untuk Deteksi Brugia Malayi Menggunakan Real-Time PCR. *Jurnal Riset Kesehatan Poltekkes Depkes Bandung*, 11(1), 314-321.

Subiyandono. 2013. *Uji Aktivitas Antioksidan Ekstrak Camellia sinensis, Hibiscus sabdariffa dan Phaleria macrocarpa* (Scheff.) Boerl. Secara Spektofotometri dengan DPPH. Jurusan Farmasi POLTEKES DEPKES Palembang.

Sudiyani, Y., M. E. Prastyo, R. Maryana, E. Triwahyuni, and Muryanto. 2021. *The budding yeast Saccharomyces cerevisiae as a valuable model organism for investigating anti-aging compounds*.

Suharsono, S., Firdaus, S., & Suharsono, U. W. (2008). Isolasi dan pengklonan fragmen cDNA dari gen penyandi multidrug resistance associated protein dari Melastoma affine. *Makara Journal of Science*, 11(2), 8.



- Tristanto, R., Putri, M.A., Situmorang, A.P., Suryanti. 2014. Optimalisasi Pemanfaatan Daun Lamun Thalassia hemprichii sebagai sumber antioksidan alami. *Indonesian Journal of Fisheries Science and Technology (IJFST)* Vol. 10 No.1: 26 -29.
- Vongsak, B., S. Kongkiatpaiboon, S. Jaisamuta, and K. Konsap. 2018. Comparison of active constituents, antioxidant capacity, and α -glucosidase inhibition in Pluchea indica leaf extracts at different maturity stages. *Food Bioscience*, 25(2018): 68-73.
- Wang, C., B. Kaltenboeck and M. Freeman. 2012. Veterinary PCR diagnostics. *Veterinary PCR Diagnostics*. (March 2012): 2–17. doi: 10.2174/97816080534831120101.
- Warraich, U.-A., Hussain, F., & Kayani, H. U. R. 2020. Aging—Oxidative stress, antioxidants and computational modeling. *Heliyon*, 6(5), e04107.
- Weber, S.U. 2009. *Antioxidants*, in Handbook of Cosmetics Science and Technology. 3rd ed, editor Maibach HI. Informa Healthcare. New York. pp. 301- 310
- Widyawati, P. S., T. D. W. Budianta, F. A. Kusuma, and E. L. Wijaya. 2014. Difference of solvent polarity to phytochemical content and antioxidant activity of Pluchea indica Less leaves extract. *International Journal of Pharmacognosy and Phytochemical Research*, 6(4): 850-855.
- Yodsaoue, O., Sonprasit, J., Karalai, C., Ponglimanont, C., Tewtrakul, S., and Chantrapromma, S. 2012. Diterpenoids and triterpenoids with potential anti-inflammatory activity from the leaves of *Aglaia odorata*. *Phytochemistry*, 76, 83–91.
- Yockteng, R., Almeida, A. M., Yee, S., Andre, T., Hill, C., & Specht, C. D. (2013). A method for extracting high-quality RNA from diverse plants for next-generation sequencing and gene expression analyses. *Applications in plant sciences*, 1(12), 1300070.
- Yovita dan Yoanna. 2010. *Tanaman Obat Plus Pengobatan Alternatif*. Setia Kawan: Jakarta
- Yuhernita dan Juniarti. 2011. “Analisis Senyawa Metabolit Sekunder Dari Ekstrak Metanol Daun Surian Yang Berpotensi Sebagai Antioksidan.” *MAKARA of Science Series* 15(1):48–52.
- Zhang S, and Duan E. 2018. Fighting against skin aging: the way from bench to bedside. *Cell Transplant*. 27: 729-738.



UNIVERSITAS
GADJAH MADA

LEVEL EKSPRESI GEN GPX1 PADA *Saccharomyces cerevisiae* SETELAH PERLAKUAN EKSTRAK

DAUN BELUNTAS

(*Pluchea indica L.*)

CINTA ALIVIA ATHA, Dr. Fajar Sofyantoro, S.Si., M.Sc.

Universitas Gadjah Mada, 2024 | Diunduh dari <http://etd.repository.ugm.ac.id/>

Zimmermann, A., Hofer, S., Pendl, T., Kainz, K., Madeo, F., and Carmona-Gutierrez, D.

2018. Yeast as a tool to identify anti-aging compounds. *FEMS Yeast Research*,

18(6).

Zhu, M., Yang, T., Wei, S., DeWan, A. T., Morell, R. J., Elfenbein, J. L., ... & Friderici,

K. H. (2003). Mutations in the γ -actin gene (ACTG1) are associated with dominant progressive deafness (DFNA20/26). *The American Journal of Human Genetics*, 73(5), 1082-1091.