

DAFTAR PUSTAKA

- Abubakar, A. R., Haque, M. 2020. Preparation of Medicinal Plants: Basic Extraction and Fractionation Procedures for Experimental Purposes. *Journal of Pharmacy & BioAllied Sciences*. 12(1): 1-10.
- Afriyana, R., Junando, M., Nurmasuri. 2023. Potensial Ekstrak Herbal Kunyit (*Curcuma Longa*) Sebagai Anti Bakteri dan Anti Inflamasi. *Agromedicine*. 10(1): 128-132.
- Aggarwal, B. B., Gupta, S. C., Sung, B. 2013. Curcumin: An Orally Bioavailable Blocker of TNF and Other Pro-Inflammatory Biomarkers. *British Journal of Pharmacology*. 168(8): 1672-1692.
- Ahmad, B., Rehman, M. U., Amin, I., Arif, A., Rasool, S., Bhat, S. A. A Review on Pharmacological Properties of Zingerone (4-(4-Hydroxy-3-methoxyphenyl)-2-butanone). *Scientific World Journal*. 2015(816364): 1-6.
- Alzarea, S. I., Alasmari, A. F., Alanazi, A. S., Alzaria, A. I., Alharbi, M., Alshammari, A *et al.* 2022. Butin Attenuates Arthritis in Complete Freund's Adjuvant-Treated Arthritic Rats: Possibly Mediated by Its Antioxidant and Anti-Inflammatory Actions. *Frontiers*. 13(810052): 1-10.
- Anuar, A. H. B. S., Levita, J. 2018. Review: Seledri *Apium graveolens*. Linn. Sebagai Tablet Anti-Inflamasi. *Farmaka*. 16(1): 72-82.
- Artasya, R., Parapasan, S. A. 2020. Jahe sebagai Antiinflamasi. *Jurnal Penelitian Perawat Profesional*. 3(2): 309-316.
- Asmari, A. K. A., Athar, T., Kadasah, S. G. 2017. An Updated Phytopharmacological Review on Medicinal Plant of Arab Region: *Apium graveolens* Linn. *Pharmacognosy Review*. 11(21): 13-18.
- Athala, S. 2021. Efektivitas Gastroprotektif Rimpang Kunyit (*Curcuma Domestica Val*) pada Lambung Yang Di Induksi Aspirin. *Jurnal Ilmiah Kesehatan Sandi Husada*. 10(2): 402-407.
- Atmaja, S. P., Kurniawaty, A. Y., Kristariyanto, Y. A. 2022. Interaksi Antibiotik dengan Obat Lainnya pada Pasien Pediatri: Sebuah Kajian Naratif. *Jurnal Farmasi dan Kesehatan Indonesia*. 2(2): 1-8.
- Badaring, D. R., Sari, S. P. M. S., Nurhabiba, S., Wulan, W., Lembang, S. A. R. 2020. Uji Ekstrak Daun Maja (*Angle marmelos L.*) terhadap Pertumbuhan Bakteri

Escherichia coli dan *Syaphylococcus aureus*. *Indonesian Journal of Fundamental Sciences (IJFS)*. 6(1): 16-26.

Bai, L. L., Chen, H., Zhou, P., Yu, J. 2021. Identification of Tumor Necrosis Factor Alpha (TNF- α) Inhibitor in Rheumatoid Arthritis Using Network Pharmacology and Molecular Docking. *Frontiers in Pharmacology*. 12(690118): 1-12.

Bashir, N., Ahmad, S. B., Rehman, M. U., Muzamil, S., Bhat, R. R., Shazly, G. A *et al.* 2021. Zingerone (4-(four-hydroxy-3-methylphenyl) butane-two-1) Modulates Adjuvant-Induced Rheumatoid Arthritis by Regulating Inflammatory Cytokines and Antioxidants. *Redox Report*. 26(1): 62-70.

Benyamin, O., Goyal, A., Lappin, S. L. 2023. *Disease-Modifying Antirheumatic Drugs (DMARDs)*. Treasure Island: StatPearls Publishing.

Bitwell, C., Indra, S. S., Luke, C., Kakoma, M. K. 2023. A Review of Modern and Conventional Extraction Techniques and their Applications for Extracting Phytochemicals from Plants. *Scientific African*. 19(e01585): 1-19.

Chauhan, K., Jandu, J. S., Brent, L. H., Al-Dhahir, M. A. 2023. *Rheumatoid Arthritis*. Treasure Island: StatPearls Publishing.

Choosri, N., Tanasawet, S., Chonpathompikunlert, R., Sukketsiri, W. 2016. *Apium graveolens* Extract Attenuates Adjuvant Induced Arthritis by Reducing Oxidative Stress. *Journal of Food Biochemistry*. 41(1): 1-10.

Deane, K. D., Demoruelle, M. K., Kelmenson, L. B., Kuhn, K. A., Norris, J. M., Holers, V. M. 2017. Genetic and Environmental Risk Factors for Rheumatoid Arthritis. *Best Practice & Research Clinical Rheumatology*. 31(1): 3-18.

Faizal, N. F. A. B., Iskandar, Y. 2018. Artikel Tinjauan: Studi Kimia dan Aktivitas Farmakologi Tanaman Seledri (*Apium Graviolens* L.). *Farmaka*. 16(2): 28-32.

Fajarianto, N. A. D. 2025. Efek Kombinasi Ekstrak Jahe, Kunyit, dan Seledri terhadap Volume Inflamasi pada Tikus yang Diinduksi Complete Freund's Adjuvant (CFA). *Skripsi*. Universitas Jenderal Soedirman, Purwokerto. 93 Hal (Tidak dipublikasikan).

Federer, W. 1963. *Experimental Design, Theory And Application*. New York: Mac Millan.

Fuloria, S., Mehta, J., Chandel, A., Sekar, M., Rani, N. N. I. M. R., Begum, M. Y *et al.* 2022. A Comprehensive Review on the Therapeutic Potential of *Curcuma longa* Linn. in Relation to its Major Active Constituent Curcumin. *Frontiers in Pharmacology*. 13(2022): 1-27.

- Ghlichloo, I., Gerriets, V. 2023. *Nonsteroidal Anti-Inflammatory Drugs (NSAIDs)*. Treasure Island: StatPearls Publishing.
- Gupta, A., Pandey, A. K. 2019. *Nutraceuticals and Natural Product Pharmaceuticals*. India: Academic Press.
- Harrison, T. R., Resnick, W. R., Wintrobe, M. M., Thorn, G. W., Adams, R. D., Beeson, P. B et al. 2015. *Harrison's Principles of Internal Medicine 19th Edition*. New York: McGraw-Hill Education.
- Hidayat, R., Suryana, B. P. P., Wijaya, L. K., Ariane, A., Hellmi, R. Y., Adnan, E et al. 2021. *Diagnosis dan Pengelolaan Arthritis Reumatoid*. Jakarta: Perhimpunan Reumatologi Indonesia
- Hodgens, A., Sharman, T. 2023. *Corticosteroids*. Treasure Island: StatPearls Publishing.
- Hrapkiewicz, K., Colby, L., Denison, P. 2013. *Clinical Laboratory Animal Medicine Fourth Edition*. USA: Wiley Blackwell.
- Hwang, J. H., Jung, W. J., Park, Y. K. 2017. Effects of *Zingiber officinale* Extract on Collagen-induced Arthritis in Mice and IL-1 β -induced Inflammation in Human Synovial Fibroblasts. *Sage Journals*. 15(3): 168-178.
- Ilyas, S., Ishfaq, I., Fatima, D. K., Tariq, A., Shahzadi, K., Rashid, M et al. 2024. Synergistic Effect of *Zingiber officinale* (Ginger) and *Curcuma longa* L. (Curcumin Analogs) for Anti-Inflammatory, Anti-Nociceptive Activity and Analgesic Potentials. *Journal of Population Therapeutics and Clinical Pharmacology*. 31(3): 1363-1369.
- ITIS. 2023. *Apium graveolens* L.. Integrated Taxonomic Information System. <https://www.gbif.org/species/5371879>. Diakses 16 Maret 2024.
- ITIS. 2023. *Curcuma Longa*. Integrated Taxonomic Information System. <https://www.gbif.org/species/102228723>. Diakses 10 Maret 2024.
- ITIS. 2023. *Rattus Norvegicus*.. Integrated Taxonomic Information System. <https://www.gbif.org/species/102121574>. Diakses 9 April 2024.
- ITIS. 2023. *Zingiber officinale*. Integrated Taxonomic Information System. <https://www.gbif.org/species/102228767>. Diakses 10 Maret 2024.

- Ismail, C. A. N., Noh, A. S. M., Khir, N. A. M., Tan, D. C. 2022. A Review on Complete Freund's Adjuvant-Induced Arthritic Rat Model: Factors Leading to its Success. *International Islamic University Malaysia*. 21(4): 3-12.
- Jakubczyk, K., Durgza, A., Katarzyna, J., Żyndecka, K. S. 2020. Antioxidant Potential of Curcumin-A Meta Analysis of Randomized Clinical Trials. *MDPI Journals*. 9(11): 1092.
- Jang, D. I., Lee, A. H., Shin, H. Y., Ryeong, L. H., Park, J. H., Kang, T. B *et al.* 2021. The Role of Tumor Necrosis Factor Alpha (TNF- α) in Autoimmune Disease and Current TNF- α Inhibitors in Therapeutics. *MDPI Journals*. 22(5): 2719.
- Jeong, J. Y., Hwang, Y. J., Jung, I. G., Yum, S. H. 2023. In Vitro Synergistic Inhibitory Effects of Plant Extract Combinations on Bacterial Growth of Methicillin-Resistant *Staphylococcus aureus*. *Pharmaceuticals*. 16(10): 1491.
- Kementerian Kesehatan. 2019. *Laporan Nasional Risesdas 2018*. Badan Penelitian dan Pengembangan Kesehatan, Departemen Kesehatan, Jakarta. 628 hal.
- Khalandar, S. D., Adithya, N., Basha, S. J., Koshma, M., Subbareddy, U. V., Reddy, V. J. S. 2018. A Current Review on *Curcuma Longa Linn*. Plant. *International Journal of Pharmaceutical, Chemical, and Biological Sciences*. 8(1): 68-73.
- Kholieqoh, A. H., Anam, K., Kusrini, D. 2022. Isolation and Antioxidant Activity of Flavonoid Compound in Ethanolic Extract of Celery Leaves (*Apium graveolens L.*). *Jurnal Kimia Sains dan Aplikasi*. 25(12): 450-455.
- Kocadam, B., Şanlıer, N. 2015. Curcumin, an Active Component of Tumeric (*Curcuma longa*), and Its Effects on Health. *Critical Reviews in Food Science and Nutrition*. 57(13): 2889-2895.
- Kooti, W., Daraei, N. 2017. A Review of the Antioxidant Activity of Celery (*Apium graveolens L.*). *Journal of Evidence-Based Complementary & Alternative Medicine*. 22(4): 1029-1034.
- Lee, E. H., Oh, J. H., Selvaraj, S., Park, S. M., Choi, M. S., Spanel, R *et al.* 2016. Immunogenomics reveal molecular circuits of diclofenac induced liver injury in mice. *Oncotarget*. 7(12): 14.983-15.017.
- Li, Y., Bai, J. Y., Xia, S., Mao, M., Li, X., Li, N *et al.* 2019. The Roles of Synovial Hyperplasia, Angiogenesis and Osteoclastogenesis in the Protective Effect of Apigenin on Collagen-Induced Arthritis. *International Immunopharmacology*. 73(2019): 362-369.

- Liu, T., Lingyun, Z., Joo, D., Matahari, S. C. 2017. NF- κ B Signaling in Inflammation. *Nature*. 2(17023): 1-9.
- Liu, Y. L., Lin, H. M., Zou, R., Wu, J. C., Han, R., Raymond, L. N *et al.* 2009. Suppression of Complete Freund's Adjuvant-Induced Adjuvant Arthritis by Cobratoxin. *Acta Pharmacologica Sinica*. 30(2): 219-227.
- Mahdi, H. J, Khan, N. A. K., Asmawi, M. Z. B.m Mahmud, R., Murugaiyah, V. A. 2018. In Vivo Anti-Arthritic and Anti-Nociceptive Effects of Ethanol Extract of *Moringa oleifera* Leaves on Complete Freund's Adjuvant (CFA)-Induced Arthritis in Rats. 2018. *Integrative Medicine Research*. 7(2018): 85-94.
- Maryam, H., Azhar, S., Akhtar, M. N., Asgar, A., Said, F., Ateq, H *et al.* 2023. Role of Bioactive Components of Ginger in Management of Osteoarthritis: A Review. *International Journal of Food Properties*. 26(1): 1903-1913.
- Mao, Q. Q., Xu, X. Y., Cao, S. Y., Gan, R. Y., Corke, H., Beta, T *et al.* 2019. Bioactive Compounds and Bioactivities of Ginger (*Zingiber officinale Roscoe*). *MDPI Journals*. 8(6): 185.
- Margono, R. 2022. Efek Pemberian Ekstrak Etanol Seledri (*Apium graveolens L.*) terhadap Ekspresi Gen Tumor Necrosis Factor- α (TNF- α) Tikus Putih (Sprague dawley) Model 5/6 Subtotal Nefrektomi. *Skripsi*. Universitas Jenderal Soedirman, Purwokerto. 63 Hal (Tidak dipublikasikan).
- Mathews, A., Arbal, A. V., Kaarunya, A., Jha, P. K., Bail, A. L., Rawson, A. 2024. *Extraction Processes in the Food Industry*. India: Elsevier.
- Mehta, A. K., Gracias, D. T., Croft., M. 2018. TNF Activity and T Cells. *Elsevier*. 101(2018): 14-18.
- Meilina, R., Mukhtar, R. 2018. Efek Antiinflamasi Ekstrak Etanol Rimpang Kunyit (*Curcuma domestica Val.*) pada Tikus Putih yang Diinduksi Karagenan. *Journal of Healthcare Technology and Medicine*. 4(1): 111-117.
- Morata, A., Gonzáles, C., Tesfaye, W., Loira, I., Lepe, J. A. S. 2019. *Red Wine Technology*. Madrid: Academic Press.
- Mueller, A. L., Payandeh, Z., Mohammadkhani, N., Mubarak, S. M., Zakeri, A. Bahrami, A. A *et al.* 2021. Recent Advances in Understanding the Pathogenesis of Rheumatoid Arthritis: New Treatment Strategies. *MDPI Journals*. 10(11): 1-38.
- Nagaratnam, N., Nagaratnam, K., Cheuk, G. 2018. *Rheumatoid Arthritis*. Germany: Springer International Publishing AG.

- Noh, A. S. M., Chuan, T. D., Khir, N. A. M., Zin, A. A. M., Ghazali, A. K., Long, I et al. 2021. Effects of Different Doses of Complete Freund's Adjuvant on Nociceptive Behaviour and Inflammatory Parameters in Polyarthritic Rat Model Mimicking Rheumatoid Arthritis. *Plos One*. 16(12): 1-24.
- Nuralifah., Parawansah., Malik, F., Yulianti, N. 2022. Aktivitas Daun Notika (*Archboldiodendron calosericeum Kobuski*) terhadap Kadar *Tumor Necrosis Factor Alpha* (TNF- α) pada Tikus. *Medula*. 10(1): 1-8.
- Pramiastuti, O., Wahyuono, S., Fakhruhin, N., Astuti, P. 2023. Phytochemical and Pharmacological Activities of *Curcuma purpurascens* Blume, A Review. *Journal of Tropical Biodiversity and Biotechnology*. 8(1): 1-14.
- Purwaningsih, H. 2022. *Pengaruh Ekstrak Seledri Terhadap Ekspresi Gen Caspase-3 dan Ekspresi Gen TNF- α Ginjal pada Keracunan Timbal*. Tesis. Fakultas Kedokteran. Universitas Islam Sultan Agung, Semarang. 66 hal. (Tidak dipublikasikan).
- Rahaman, M. M., Rakib, A., Mitra, S., Tareq, A. M., Emran, T. B., Daula, A. S. U et al. 2021. The Genus *Curcuma* and Inflammation: Overview of the Pharmacological Perspectives. *MDPI journals*. 10(1): 1-19.
- Ramadan, G., Al-Kahtani, M. A., El-Sayed, W. M. 2011. Anti-Inflammatory and Anti-Oxidant Properties of *Curcuma longa* (Turmeric) versus *Zingiber officinale* (Ginger) Rhizomes in Rat Adjuvant-Induced Arthritis. 34(4): 291–301.
- Sahebkar, A., Cicero, A. F., Mendia, L. E. S., Anggarwal, B. B., Gupta, S. C. 2016. Curcumin Downregulates Human Tumor Necrosis Factor- α Levels: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Elsevier*. 17(2016): 234-242.
- Santosa, B. 2020. *Teknik Elisa Metode Elisa untuk Pengukuran Protein Metallothionein pada Daun Padi Ir Bagendit*. Semarang: Unimus Press.
- Sapri., Siswanto, E., Yulianti, A. 2017. Uji Aktivitas Antiinflamasi Fraksi Air Ekstrak Daun Seledri (*Apium Graveolens L.*) Pada Mencit Jantan. *Jurnal Ilmiah Ibnu Sina*. 2(1): 60-67.
- Saputra, A., Sujatmiko, B. 2017. Media Pembelajaran Berbasis Animasi 2D Instalasi Proxy Server dan Web Server untuk Siswa Kelas XI TKJ di SMK Negeri 2 Surabaya. *Jurnal IT-EDU*. 2(2): 218-222.

- Sari, D., Nasuha, A. 2021. Kandungan Zat Gizi, Fitokimia, dan Aktivitas Farmakologis pada Jahe (*Zingiber officinale* Rosc.): Review. *Journal of Biological Science*. 1(2): 11-18.
- Sari, T., F. 2022. *Pengaruh Pemberian Ekstrak Jahe Merah terhadap Kadar Serum dan Serum Malondialdehida (Studi Eksperimental pada Tikus Jantan Galur Wistar yang Diinfeksi Bakteri Pseudomonas aeruginosa)*. Skripsi. Universitas Islam Sultan Agung, Semarang. 66 hal (Tidak dipublikasikan).
- Sari, T., F. 2022. The Effect of Red Ginger Extract on TNF- α and Malonaldehyde Serum Level. *International Journal of Multidisciplinary Research and Analysis*. 5(12):1-5.
- Setiati, S., Alwi, I., Sudoyo, A. W., Simadibrata, M., Setiyohadi, B., Syam, A. F. 2016. *Buku Ajar Ilmu Penyakit Dalam Edisi VI*. Jakarta: InternaPublishing.
- Seo, H. S., Sikder, M. A., Lee, H. J., Ryu, J., Lee, C. J. 2014. Apigenin Inhibits Tumor Necrosis Factor- α -Induced Production and Gene Expression of Mucin through Regulating Nuclear Factor-Kappa B Signaling Pathway in Airway Epithelial Cells. *Biomolecules & Therapeutics*. 22(6): 525-531.
- Sohail, R., Mathew, M., Patel, K. K., Reddy, S. A., Haider, Z., Naria, M *et al.* 2023. Effects of Non-steroidal Anti-inflammatory Drugs (NSAIDs) and Gastroprotective NSAIDs on the Gastrointestinal Tract: A Narrative Review. *Cureus*. 15(4): e37080.
- Sukketsiri, W., Chonpathompikunlert, P., Tanasawet, S., Choosri, N., Wongtawatchai, T. 2016. Effects of *Apium graveolens* Extract on the Oxidative Stress in the Liver of Adjuvant-Induced Arthritic Rats. *Prevention Nutrition and Food Science*. 21(2): 79-84.
- Sulistyo, S. 2022. *Pengaruh Pemberian Ekstrak Seledri terhadap Kadar TNF- α dan Ekspresi Caspase-3 Otak pada Keracunan Timbal (Studi Eksperimental In Vivo pada Tikus Terpapar Timbal Asetat 14 hari)*. Skripsi. Universitas Islam Sultan Agung, Semarang. 83 Hal (Tidak dipublikasikan).
- Suprpto, N., Novianto, E., Hoemardani, A. S. D. 2022. Penggunaan Anti TNF- α dalam Bidang Dermatologi. *Journal of The Indonesian Medical Association*. 72(5): 244-258.
- Suprihatin, T., Rahayu, S., Rifa'i, M., Widyarti, S. 2020. Senyawa pada Serbuk Rimpang Kunyit (*Curcuma longa* L.) yang Berpotensi sebagai Antioksidan. *Buletin Anatomi dan Fisiologi*. 5(1): 35-42.

- Tanvir, E., Hossen, M. S., Hossain, M. F., Afroz, R., Gan, S. H., Khalil, M. I *et al.* 2017. Antioxidant Properties of Popular Turmeric (*Curcuma longa*) Varieties from Bangladesh. *Journal of Food Quality*. 2017(1): 1-8.
- Ureña, N. M., Oliveira, C. P., Guterres, S. S., Pohlmann, A. R., Tadeu, O., Costa, F *et al.* 2023. The Anti-Arthritic Activity of Diclofenac Lipid-Core Nanocapsules: Stereological Analysis Showing More Protection of Deep Joint Components. *MDPI Journals*. 28(13):5219.
- Varma, K., Jude, S., Varghese, B. A., Kuttappan, S., Amalraj, A. 2023. *Curcuma longa*. United States: Elsevier.
- Vdoviakova, K., Petrovova, E., Maloveská, M., Teleky, J., Krešáková, L., Elias, M. Z. J *et al.* 2016. Surgical Anatomy of the Gastrointestinal Tract and Its Vasculature in the Laboratory Rat. *Gastroenterology Research and Practice*. 2016(2632368): 1-12.
- Venetsanopoulou, A. I., Alamanos, Y., Voulgari, P. V., Drosos, A. A. 2023. Epidemiology and Risk Factors for Rheumatoid Arthritis Development. *Mediterranean Journal of Rheumatology*. 34(4): 404-413.
- WHO. 2023. *Rheumatoid Arthritis* (online). World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/rheumatoid-arthritis>. Diakses 23 Februari 2024.
- Wakhidah, A. Z. 2021. Review: Seledri (*Apium graveolens* L.): Botani, Ekologi, Fitokimia, Bioaktivitas, dan Pemanfaatan. *Jurnal Pro-Life*. 8(2): 156-167.
- Wang, Q., Ye, C. Q., Matahari, S., Li, R., Shi, X., Wang, S *et al.* 2019. Curcumin Attenuates Collagen-Induced Rat arthritis via Anti-Inflammatory and Apoptotic Effects. *International Immunopharmacology*. 72(2019): 292-300.
- Westra, J., Fia, F. 2018. Overview of Rheumatoid Arthritis therapy: Management options in Indonesia. *Tarumanagara Medical Journal*. 1(1): 208-220.
- Widodo, F., Lyrawati, D., Suryana, B. P. P. 2016. Potential of Topical Curcumin in Reduction of TNF- α expression and Synovium Hyperplasia on Wistar Rats of Rheumatoid Arthritis Model. *Research Journal of Life Science*. 3(1): 40-48.
- Windarsih, G., Utami, D. W., Yuriyah, S. 2021. Morphological Characteristics of Zingiberaceae in Serang District, Banten, Indonesia. *Biodiversitas*. 22(12): 5507-5529.

- Wulandari, D. I., Fitriyaningsih, S. P., Mulqie, L. 2016. Uji Aktivitas Antiinflamasi Ekstrak Etanol Herba Seledri (*Apium graveolens L.*) terhadap Tikus Wistar Jantan. *Prosiding Farmasi*. 2(1): 59-63.
- Yoon, J. H., Kim, M. Y., Cho, J. Y. 2023. Apigenin: A Therapeutic Agent for Treatment of Skin Inflammatory Diseases and Cancer. *MDPI Journals*. 24(2): 1-16.
- Yustinianus, R. R., Wunas, J., Rifai, Y., Ramli, N. 2019. Curcumin Content in Extract of some Rhizomes from *Zingiberaceae* Family. *Journal of Pharmaceutical and Medicinal Sciences*. 4(1): 15-19.
- Zarandi, F. P., Zarghani, S. S., Rafraf, M. 2021. Curcumin and Rheumatoid Arthritis: A Systematic Review of Literature. *International Journal of Clinical Practice*. 75(10): e14280.
- Zhang, Q. W., Lin, L. G., Ye, W. C. 2018. Techniques for Extraction and Isolation of Natural Products: A Comprehensive Review. *Chinese Medicine*. 13(20): 1-26.
- Zhou, X., Afzal, S., Wohlmuth, H., Munch, G., Leach, D., Rendah, M *et al.* 2022. Synergistic Anti-Inflammatory Activity of Ginger and Turmeric Extracts in Inhibiting Lipopolysaccharide and Interferon- γ -Induced Proinflammatory Mediators. *MDPI Journals*. 27(12): 1-17.

