

DAFTAR PUSTAKA

- Adhani, R., & Husaini. (2017). Logam Berat Sekitar Manusia. Lambung Mangkurat University Press: Banjarmasin.
- Alfayeth, B. (2022). Embriogenesis dan Rekonstruksi Filogeni Ikan *Oryzias woworae* Parenti & Hadiaty, 2010 sebagai Dasar Studi Ekotoksikologi. Skripsi. Fakultas Ilmu Kelautan dan Perikanan. Universitas Hasanuddin: Makassar
- Agustina, T. (2014). Kontaminasi Logam Berat Pada Makanan Dan Dampaknya Pada Kesehatan. *Teknobuga*, 1(1), 53–65.
- Ayeni, O. O., Ndakidemi, P. A., Snyman, R. G., & Odendaal, J. P. (2010). Chemical, Biological and Physiological Indicators of Metal Pollution in Wetlands. *Scientific Research and Essays*, 5, 1938–1949.
- Barjhoux, I., Baudrimont, M., Morin, B., Landi, L., Gonzalez, P., & Cachot, J. (2012). Effects of Copper and Cadmium Spiked-Sediments on embryonic Development of Japanese Medaka (*Oryzias latipes*). *Ecotoxicology and Environmental Safety*, 79, 272–282. <https://doi.org/10.1016/j.ecoenv.2012.01.011>
- Barjhoux, I., Gonzalez, P., Baudrimont, M., & Cachot, J. (2016). Molecular and Phenotypic Responses of Japanese medaka (*Oryzias latipes*) Early Life Stages to Environmental Concentrations of Cadmium in Sediment. *Environmental Science and Pollution Research*, 23, 17969–17981. <https://doi.org/10.1007/s11356-016-6995-4>
- Buikema, A. L., Niederlehner, B. R., & Cairns, J. (1982). Biological Monitoring part IV-Toxicity Testing. *Water Research*, 16, 239–262. [https://doi.org/10.1016/0043-1354\(82\)90188-9](https://doi.org/10.1016/0043-1354(82)90188-9)
- Calabrese, E. J., & Baldwin, L. A. (2001). The frequency of U-shaped Dose Responses in the Toxicological Literature. *Toxicological Sciences*, 62(2), 330-338.
- Cao, L., Huang, W., Shan, X., Xiao, Z., Wang, Q., & Dou, S. (2009). Cadmium Toxicity to Embryonic–larval Development and Survival in Red Sea Bream *Pagrus major*. *Ecotoxicology and environmental safety*, 72(7), 1966-1974. doi:10.1016/j.ecoenv.2009.06.002
- Chow, E. S. H., & Cheng, S. H. (2003). Cadmium Affects Muscle Type Development and Axon Growth in Zebrafish Embryonic Somitogenesis. *Toxicological Sciences*, 73(1), 149-159.
- Damayani, I. A., B, A. K., Yaqin, K., & Irmawati. (2022). Pengaruh Paparan Logam Timbal Terhadap Kematian Embrio Ikan Medaka Embrio (*Oryzias Celebensis* Weber, 1894) di Indonesia. *SIGANUS: Journal of Fisheries and Marine Science*, 3(2), 215–221.
- Dauwe, T., Janssens, E., Kempenaers, B., & Eens, M. (2004). The Effect of Heavy Metal Exposure on Egg Size, Eggshell Thickness And The Number Of Spermatozoa In Blue Tit *Parus Caeruleus* Eggs. *Environmental Pollution*, 129, 125–129. <https://doi.org/10.1016/j.envpol.2003.09.028>
- Dubińska-Magiera, M., Daczewska, M., Lewicka, A., Migocka-Patrzałek, M., Niedbalska-Tarnowska, J., & Jagla, K. (2016). Zebrafish: A Model for the Study Of Toxicants Affecting Muscle Development and Function. *International journal of molecular sciences*, 17(11), 1941. doi:10.3390/ijms17111941

- Fahmi, M. R., Prasetyo, A. B., & Vidiakusuma, R. (2008). Potensi Ikan Medaka (*Oryzias woworae*, *O. javanicus* dan *O. profundicola*) sebagai Ikan Hias dan Ikan Model. *Prosiding Seminar Nasional Ikan Ke 8*, 227–233. <http://iktiologi-indonesia.org/wp-content/uploads/2018/01/24-Melta-Rini-Fahmi.pdf>
- Foran, C. M., Peterson, B. N., & Benson, W. H. (2002). Influence of Parental and Developmental Cadmium Exposure on Endocrine and Reproductive Function in Japanese medaka (*Oryzias latipes*). *Comparative Biochemistry and Physiology - C Toxicology and Pharmacology*, 133, 345–354. [https://doi.org/10.1016/S1532-0456\(02\)00128-X](https://doi.org/10.1016/S1532-0456(02)00128-X)
- González-Doncel, M., Larrea, M., Sánchez-Fortún, S., & Hinton, D. E. (2003). Influence of Water Hardening of the Chorion on Cadmium Accumulation in Medaka (*Oryzias latipes*) Eggs. *Chemosphere*, 52, 75–83. [https://doi.org/10.1016/S0045-6535\(03\)00227-3](https://doi.org/10.1016/S0045-6535(03)00227-3)
- González-Doncel, M., Okihira, M. S., Villalobos, S. A., Hinton, D. E., & Tarazona, J. V. (2005). A quick reference guide to the normal development of *Oryzias latipes* (Teleostei, Adrianichthyidae). *Journal of Applied Ichthyology*, 21(1), 39-52.
- Hallare, A. V., Schirling, M., Luckenbach, T., Köhler, H. R., & Triebkorn, R. (2005). Combined Effects of Temperature and Cadmium on Developmental Parameters and Biomarker Responses in Zebrafish (*Danio rerio*) Embryos. *Journal of Thermal Biology*, 30, 7–17. <https://doi.org/10.1016/j.jtherbio.2004.06.002>
- Hirako, A., Takeoka, Y., Furukawa, S., & Sugiyama, A. (2017). Effects of Cadmium Exposure on Medaka (*Oryzias latipes*) Testes. *Journal of Toxicologic Pathology*, 30, 255–260. <https://doi.org/10.1293/tox.2017-0015>
- Hutagalung, H. P. (1984). Logam berat dalam Lingkungan Laut. *Oseana*, 9, 11–20.
- Ishikawa, Y. (2000). Medakafish as a Model System for Vertebrate Developmental Genetics. *BioEssays*, 22(5), 487–495.
- Ismail, A., & Yusof, S. (2011). Effect Of Mercury and Cadmium on Early Life Stages of Java Medaka (*Oryzias javanicus*): A potential tropical test fish. *Marine Pollution Bulletin*, 63, 347–349. <https://doi.org/10.1016/j.marpolbul.2011.02.014>
- Johnson, A., Carew, E., & Sloman, K. A. (2007). The Effects of Copper on the Morphological and Functional Development of Zebrafish Embryos. *Aquatic Toxicology*, 84(4), 431-438. doi:10.1016/j.aquatox.2007.07.003
- Jonak, C., Nakagami, H., & Hirt, H. (2004). Heavy Metal Stress. Activation of Distinct Mitogen-activated Protein Kinase Pathways by Copper and Cadmium. *Plant Physiology*, 136, 3276–3283. <https://doi.org/10.1104/pp.104.045724>
- Kasahara, M., Naruse, K., Sasaki, S., Nakatani, Y., Qu, W., Ahsan, B., Yamada, T., Nagayasu, Y., Doi, K., Kasai, Y., Jindo, T., Kobayashi, D., Shimada, A., Toyoda, A., Kuroki, Y., Fujiyama, A., Sasaki, T., Shimizu, A., Asakawa, S., ... Kohara, Y. (2007). The Medaka Draft Genome and Insights into Vertebrate Genome Evolution. *Nature*, 447, 714–719. <https://doi.org/10.1038/nature05846>
- Khodadoust, D., Ismail, A., Zulkifli, S. Z., & Hoseini Tayefeh, F. (2013). Short Time Effect of Cadmium on Juveniles and Adults Of Java Medaka (*Oryzias javanicus*) Fish as a bioindicator for Ecotoxicological Studies. *Life Science Journal*, 10(1), 1857–1861.
- Kim, Y. J., Lee, N., Woo, S., Ryu, J. C., & Yum, S. (2016). Transcriptomic Change as Evidence for Cadmium-Induced Endocrine Disruption in Marine Fish Model of Medaka, *Oryzias javanicus*. *Molecular and Cellular Toxicology*, 12(4), 409–420. <https://doi.org/10.1007/s13273-016-0045-7>

- Kinoshita, M., Murata, K., Naruse, K. & Tanaka, M. 2009. Medaka: Biology, Management, and Experimental Protocols. *Iowa: Wiley-Blackwell*. p 445.
- Liu, K., Song, J., Chi, W., Liu, H., Ge, S., & Yu, D. (2021). Developmental Toxicity in marine medaka (*Oryzias melastigma*) embryos and larvae exposed to nickel. *Comparative Biochemistry and Physiology Part - C: Toxicology and Pharmacology*, 248(7), 1–9. <https://doi.org/10.1016/j.cbpc.2021.109082>
- Matsumoto, Y., Oda, S., Mitani, H., & Kawamura, S. (2020). Orthologous Divergence and Paralogous Anticonvergence in Molecular Evolution of Triplicated Green Opsin Genes in Medaka Fish, Genus *Oryzias*. *Genome Biology and Evolution*, 12(6), 911–923. <https://doi.org/10.1093/GBE/EVAA111>
- Michibata, H. (1981). Uptake and Distribution of Cadmium In the Egg of the Teleost, *Oryzias latipes*. *Journal of fish biology*, 19(6), 691-696.
- Myosho, T., Takahashi, H., Yoshida, K., Sato, T., Hamaguchi, S., Sakamoto, T., & Sakaizumi, M. (2018). Hyperosmotic Tolerance of adult Fish and early Embryos are determined by discrete, Single Loci in the Genus *Oryzias*. *Scientific Reports*, 8, 1–8. <https://doi.org/10.1038/s41598-018-24621-7>
- Oxendine, S. L., Cowden, J., Hinton, D. E., & Padilla, S. (2006). Adapting the medaka Embryo Assay to a High-throughput Approach for developmental Toxicity Testing. *NeuroToxicology*, 27, 840–845. <https://doi.org/10.1016/j.neuro.2006.02.009>
- O'Shields, B., McArthur, A. G., Holowiecki, A., Kamper, M., Tapley, J., & Jenny, M. J. (2014). Inhibition of Endogenous MTF-1 Signaling in zebrafish Embryos Identifies Novel Roles for MTF-1 in Development. *Biochimica et Biophysica Acta (BBA)-Molecular Cell Research*, 1843(9), 1818-1833. , <http://dx.doi.org/10.1016/j.bbamcr.2014.04.015>
- Parenti, L. R. (2008). A phylogenetic Analysis and taxonomic Revision of Ricefishes, *Oryzias* and Relatives (Beloniformes, Adrianichthyidae). *Zoological Journal of the Linnean Society*, 154(3), 494-610.
- Purbonegoro, T. (2017). Faktor-Faktor yang Mempengaruhi Toksisitas Bahan Pencemar terhadap organisme Perairan. *Oseana*, 42(2), 12-22.
- Puspasari, R. (2016). Logam Dalam Ekosistem Perairan. *BAWAL*, 1, 43–47. <https://doi.org/10.15578/bawal.1.2.2006.43-47>
- Puspitasari, R. (2016). Java Medaka Sebagai Kandidat Bioindikator di Indonesia. *Oseana*, 41, 19–26.
- Rahadian, A., & Riani, E. (2018). Pencemaran Cd pada Ekosistem Perairan Tawar dan Mekanisme Gangguannya pada Hewan Air: *Sebuah Tinjauan*. 1–10. <https://www.researchgate.net/publication/331686673%0APENCEMARAN>
- Rahim, S. W. (2017). Respons Ikan Zebra Ekor Hitam (*Dascyllus Melanurus*) Terhadap Penggunaan Anaestesi Minyak Cengkeh Sebagai Alat Bantu Penangkapan Pada Skala Laboratorium. *Marine Fisheries: Journal of Marine Fisheries Technology and Management*, 8(1), 51-61.
- Rumahlatu, D. (2012). Biomonitoring: Sebagai Alat Asesmen Kualitas Perairan Akibat Logam Berat Kadmium Pada Invertebrata Perairan. *Sainstis*, 1(1), 10–34. <https://doi.org/10.18860/sains.v0i0.1869>
- Said, D. S., & Hidayat. (2015). 101 Ikan Hias Air Tawar. In *Journal of Chemical Information and Modeling*.

- Sari, D. K., Andriani, I., Yaqin, K., & Satya, A. M. (2018). The Use of Endemic Sulawesi Medaka Fish (*Oryzias celebensis*) as an animal Model Candidate. *Proceedings of the 20th FAVA Congress & The 15th KIVNAS PDHI*, 564–565.
- Schoettger, R. a. (1996). Problems of Aquatic Toxicology , Biotesting and Water Quality Management. *Proceedings of USA- Russia Symposium, Borok, Jaroslavl Oblast*, 129–147.
- Sulistiawan, R. S., & Rukoyah. (2014). Pengaruh Pemberian Lama Waktu Kejutan Suhu terhadap Tingkat Keberhasilan Ginogenesis Ikan Koi (*Cyprinus carpio*). *Jurnal Agrosience*, 7, 41–50.
- Tilton, S. C., Foran, C. M., & Benson, W. H. (2003). Effects of Cadmium on the reproductive Axis of Japanese medaka (*Oryzias latipes*). *Comparative Biochemistry and Physiology - C Toxicology and Pharmacology*, 136(3), 265–276. <https://doi.org/10.1016/j.cca.2003.09.009>
- Valko, M., Morris, H., & Cronin, M. (2005). Metals, Toxicity and Oxidative Stress. *Current Medicinal Chemistry*, 12(10), 1161–1208. <https://doi.org/10.2174/0929867053764635>
- Wang, J., & Cao, H. (2021). Zebrafish and medaka: Important Animal Models for human Neurodegenerative Diseases. *International journal of molecular sciences*, 22(19), 10766. <https://doi.org/10.3390/ijms221910766>
- Wang, R. F., Zhu, L. M., Zhang, J., An, X. P., Yang, Y. P., Song, M., & Zhang, L. (2020). Developmental Toxicity of Copper in marine Medaka (*Oryzias melastigma*) Embryos and Larvae. *Chemosphere*, 247, 1–11. <https://doi.org/10.1016/j.chemosphere.2020.125923>
- Witeska, M., Sarnowski, P., Ługowska, K., & Kowal, E. (2014). The Effects of Cadmium and Copper on Embryonic and Larval Development of Ide *Leuciscus idus* L. *Fish physiology and biochemistry*, 40, 151-163. DOI 10.1007/s10695-013-9832-4
- Wold, M., Beckmann, M., Poitra, S., Espinoza, A., Longie, R., Mersereau, E., Darland, D.C., & Darland, T. (2017). The Longitudinal Effects of Early Developmental Cadmium Exposure on Conditioned Place Preference and Cardiovascular Physiology in Zebrafish. *Aquatic Toxicology*, 191, 73-84.
- Yaqin, K. (2019). Petunjuk Praktis Aplikasi Biomarker Sederhana. Unhas Press: Makassar
- Yaqin, K. (2021) Mengenal dengan Cepat Embriogenesis Ikan Bisini, *Oryzias celebensis* untuk Studi Ekotoksikologi. Deepublish: Makassar
- Yu, R. M., Lin, C. C., Chan, P. K., Chow, E. S. H., Murphy, M. B., Chan, B. P., Müller, F., Strañhle, U., & Cheng, S. H. (2006). Four-dimensional Imaging and quantification of Gene Expression in early Developing Zebrafish (*Danio rerio*) Embryos. *Toxicological Sciences*, 90(2), 529-538.
- Yudo, S. (2006). Kondisi Pencemaran Logam Berat Di Perairan Sungai. *JAI*, 2(1), 1–15.
- Yusof, S., Ismail, A., & Alias, M. S. (2014). Effect of glyphosate-based herbicide on early life stages of Java medaka (*Oryzias javanicus*): a potential tropical test fish. *Marine Pollution Bulletin*, 85(2), 494-498. <http://dx.doi.org/10.1016/j.marpolbul.2014.03.022>
- Zhang, H., Cao, H., Meng, Y., Jin, G., & Zhu, M. (2012). The Toxicity of Cadmium (Cd²⁺) Towards Embryos and Pro-larva of soldatov's Catfish (*Silurus soldatovi*). *Ecotoxicology and environmental safety*, 80, 258-265.

<http://dx.doi.org/10.1016/j.ecoenv.2012.03.013>

Zhang, R., Wang, M., Chen, X., Yang, C., & Wu, L. (2020). Combined Toxicity of Microplastics and Cadmium on the zebrafish Embryos (*Danio rerio*). *Science of the Total Environment*, 743, 140638. <https://doi.org/10.1016/j.scitotenv.2020.140638>

Zhu, T., Gui, L., Zhu, Y., Li, Y., & Li, M. (2018). Dnd is Required for Primordial Germ Cell Specification in *Oryzias celebensis*. *Gene*, 679, 36–43. <https://doi.org/10.1016/j.gene.2018.08.068>

LAMPIRAN

Lampiran 1. Hasil uji analisis statistik non-parametrik denyut jantung embrio *O. celebensis*

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | Fase 24 | | |
| Kruskal-Wallis test | | | |
| P value | < 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 42,23 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | 35,65 | Yes | *** |
| 0 vs 0,025 | 31,20 | Yes | *** |
| 0 vs 0,05 | 16,30 | Yes | * |
| 0 vs 0,075 | 9,350 | No | ns |

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | Fase 26 | | |
| Kruskal-Wallis test | | | |
| P value | 0,0088 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | ** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 13,58 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -9,700 | No | ns |
| 0 vs 0,025 | -7,450 | No | ns |
| 0 vs 0,05 | 10,50 | No | ns |
| 0 vs 0,075 | -8,600 | No | ns |

| | | | |
|-------------------------------|------------------------|--|--|
| Table Analyzed | Fase 28 | | |
| Kruskal-Wallis test | | | |
| P value | < 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |

| | | | |
|--|------------------------|------------------------|---------|
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 41,00 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -12,60 | No | ns |
| 0 vs 0,025 | -16,60 | Yes | * |
| 0 vs 0,05 | -30,45 | Yes | *** |
| 0 vs 0,075 | 7,400 | No | ns |

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | Fase 29 | | |
| | | | |
| Kruskal-Wallis test | | | |
| P value | < 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 39,62 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -22,55 | Yes | ** |
| 0 vs 0,025 | -13,85 | No | ns |
| 0 vs 0,05 | -28,45 | Yes | *** |
| 0 vs 0,075 | 5,600 | No | ns |

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | Fase 32 | | |
| | | | |
| Kruskal-Wallis test | | | |
| P value | 0,0002 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 21,97 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -2,150 | No | ns |
| 0 vs 0,025 | 6,800 | No | ns |
| 0 vs 0,05 | 5,450 | No | ns |
| 0 vs 0,075 | 25,15 | Yes | *** |

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | Fase 34 | | |
| Kruskal-Wallis test | | | |
| P value | < 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 31,52 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -12,75 | No | ns |
| 0 vs 0,025 | 14,30 | No | ns |
| 0 vs 0,05 | 20,50 | Yes | ** |
| 0 vs 0,075 | 3,950 | No | ns |

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | fase 36 | | |
| Kruskal-Wallis test | | | |
| P value | < 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 32,92 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | 18,75 | Yes | * |
| 0 vs 0,025 | 28,35 | Yes | *** |
| 0 vs 0,05 | -3,450 | No | ns |
| 0 vs 0,075 | 7,850 | No | ns |

| | | | |
|--|------------------------|--|--|
| Table Analyzed | fase 37 | | |
| Kruskal-Wallis test | | | |
| P value | < 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |

| | | | |
|---------------------------------|------------------------|------------------------|---------|
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 36,80 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -35,30 | Yes | *** |
| 0 vs 0,025 | -25,80 | Yes | *** |
| 0 vs 0,05 | -23,20 | Yes | ** |
| 0 vs 0,075 | -9,450 | No | ns |

Lampiran 2. Hasil uji analisis statistik non-parametrik Kelangsungan Hidup (SRe) embrio *O. celebensis*

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | SRe | | |
| Kruskal-Wallis test | | | |
| P value | 0,0857 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | ns | | |
| Do the medians vary signif. (P < 0.05) | No | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 8,167 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | 0,0 | No | ns |
| 0 vs 0,025 | 0,0 | No | ns |
| 0 vs 0,05 | 0,0 | No | ns |
| 0 vs 0,075 | 5,000 | No | ns |

Lampiran 3. Hasil uji analisis statistik non-parametrik Jumlah Somit embrio *O. celebensis*

| | | | | | |
|------------------|--------|--------|--------|--------|--------|
| Number of values | 2 | 2 | 2 | 2 | 2 |
| | | | | | |
| Minimum | 3,700 | 3,700 | 3,900 | 4,000 | 4,000 |
| 25% Percentile | 3,700 | 3,700 | 3,900 | 4,000 | 4,000 |
| Median | 4,650 | 4,500 | 4,700 | 4,650 | 4,600 |
| 75% Percentile | 5,600 | 5,300 | 5,500 | 5,300 | 5,200 |
| Maximum | 5,600 | 5,300 | 5,500 | 5,300 | 5,200 |
| | | | | | |
| Mean | 4,650 | 4,500 | 4,700 | 4,650 | 4,600 |
| Std. Deviation | 1,344 | 1,131 | 1,131 | 0,9192 | 0,8485 |
| Std. Error | 0,9500 | 0,8000 | 0,8000 | 0,6500 | 0,6000 |
| | | | | | |
| Lower 95% CI | -7,421 | -5,665 | -5,465 | -3,609 | -3,024 |
| Upper 95% CI | 16,72 | 14,66 | 14,86 | 12,91 | 12,22 |

Lampiran 4. Hasil uji analisis statistik parametrik Laju Penyerapan Kuning Telur embrio *O. celebensis*

| | | | | | |
|--|-----------------|---------|------------------------|---------|--------------------------|
| Table Analyzed | Laju penyerapan | | | | |
| One-way analysis of variance | | | | | |
| P value | < 0,0001 | | | | |
| P value summary | *** | | | | |
| Are means signif. different? (P < 0.05) | Yes | | | | |
| Number of groups | 5 | | | | |
| F | 33,83 | | | | |
| R square | 0,7505 | | | | |
| Bartlett's test for equal variances | | | | | |
| Bartlett's statistic (corrected) | 12,79 | | | | |
| P value | 0,0123 | | | | |
| P value summary | * | | | | |
| Do the variances differ signif. (P < 0.05) | Yes | | | | |
| ANOVA Table | SS | df | MS | | |
| Treatment (between columns) | 1,425e-005 | 4 | 3,562e-006 | | |
| Residual (within columns) | 4,737e-006 | 45 | 1,053e-007 | | |
| Total | 1,898e-005 | 49 | | | |
| Tukey's Multiple Comparison Test | Mean Diff, | q | Significant? P < 0,05? | Summary | 95% CI of diff |
| 0 vs 0.01 | -0,001072 | 10,45 | Yes | *** | -0,001485 to -0,0006589 |
| 0 vs 0.025 | -0,0003455 | 3,367 | No | ns | -0,0007583 to 6,734e-005 |
| 0 vs 0.05 | 0,0005537 | 5,396 | Yes | ** | 0,0001409 to 0,0009665 |
| 0 vs 0.075 | -1,859e-006 | 0,01812 | No | ns | -0,0004147 to 0,0004110 |

Lampiran 5. Hasil uji analisis statistik non- parametrik Panjang Larva Awal Menetas embrio *O. celebensis*

| | | | |
|--|----------------------------|------------------------|---------|
| Table Analyzed | Panjang larva awal menetas | | |
| Kruskal-Wallis test | | | |
| P value | 0,0001 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 22,95 | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | 8,550 | No | ns |
| 0 vs 0,025 | 10,05 | No | ns |
| 0 vs 0,05 | 28,00 | Yes | *** |
| 0 vs 0,075 | 21,15 | Yes | * |

Lampiran 6. Hasil uji analisis statistik non- parametrik Waktu penetasan embrio *O. celebensis*

| | | | |
|--|------------------------|------------------------|---------|
| Table Analyzed | waktu penetasan | | |
| Kruskal-Wallis test | | | |
| P value | 0,0003 | | |
| Exact or approximate P value? | Gaussian Approximation | | |
| P value summary | *** | | |
| Do the medians vary signif. (P < 0.05) | Yes | | |
| Number of groups | 5 | | |
| Kruskal-Wallis statistic | 21,25 | | |
| | | | |
| Dunn's Multiple Comparison Test | Difference in rank sum | Significant? P < 0,05? | Summary |
| 0 vs 0,01 | -13,40 | No | ns |
| 0 vs 0,025 | -28,75 | Yes | *** |
| 0 vs 0,05 | -9,850 | No | ns |
| 0 vs 0,075 | -13,00 | No | ns |