

PUSTAKA ACUAN

- Akpor, O. B and M. Muchie. 2010. Remediation of heavy metal in drinking water and wastewater treatment systems : processes and applications. *International Journal of Physical Sciences*. 5(12): 1807-1817.
- Anonim. 2007. *Toxicological Profile for Lead*. Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. Georgia, p: 1,2,277.
- Anonim. 2012. *Toxicological Profile for Chromium*. Agency for Toxic Substances and Disease Registry, U.S. Departments of Health and Human Services. Georgia, p:2,11,333.
- Arnon, D. 1949. *Plant Physiology*. 24: 1- 15.
- Arnot, A. J. and F. A. Gobas. 2003. A generic QSAR for assessing the bioacumulation potential of organic chemical in aquatic food webs. *QSAR Comb. Science*. 22: 337-345.
- Aung W. L., N. W. Hlaing, and K. N. Aye. 2013. Biosorption of lead (Pb²⁺) by using *Chlorella vulgaris*. *International Journal of Chemical, Environmental & Biological Sciences*. 1(2): 408-412.
- Barsanti, L. and P. Guatieri. 2014. *Algae: Anatomy, Biochemistry, and Biotechnology*, Second Edition. CRC Press. Pisa, p: 1,2.
- Berg, M.V.D., D.V.D. Meent, W.J.G.M. Peijnenburg, D.T.H.M. Sijm, J. Struijs, and J.W. Tas. 1995. *Transport, accumulation, and transformation processes*. In C.J. van Leeuwen and J.L.M. Hermens [eds.]. Risk assessment of chemical : an introduction. Kluwer Academic Publisher. Netherlands. p. 52 – 59
- Blaby-Haas, C. E., S. S. Merchant. 2012. The ins and outs of algal metal transport. *Biochimica et Biophysica Acta*. 1823: 1531-1552.
- Budiawan. 2008. Peran toksikologi forensik dalam mengungkap kasus keracunan dan pencemaran lingkungan. *Indonesian Journal of Legal and Forensic Sciences*. 1: 35-39.
- Carfagna, S., N. Lanza, G. Salbitani, A. Basile, S. Sorbo, and V. Vona. 2013. Physiological and morphological responses of lead or cadmium exposed *Chlorella sorokiniana* 211-8K (Chlorophyceae). *Springer Plus*. 2: 147
- Chick, H. 1903. A Study of a unicellular green alga, occurring in polluted water, with especial reference to its nitrogenous metabolism. *Proceedings of the Royal Society Biological Sciences Series B*. 71(475): 458-476

- da Silva Gorgônio, C. M., D. A. G. Aranda, and S. Couri. 2013. Morphological and chemical aspects of *Chlorella pyrenoidosa*, *Dunaliella tertiolecta*, *Isochrysis galbana* dan *Tetraselmis gracilis* Microalgae. *Natural Science*. 5(7): 783-791.
- Das, N., R. Vimala, and P. Karthika. 2008. Biosorption of heavy metals-an overview. *Indian Journal of Biotechnology*. Vol. 7: 159-169.
- Dao, Ly H. T. and J. Beardall. 2016. Effects of lead on two green microalgae *Chlorella* and *Scenedesmus*: Photosystem II activity and heterogeneity. *Algal Research*. 16: 150-159
- De-Filippis, L. F., R. Hampp, and H. Ziegler. 1981. The effects of sublethal concentrations of zinc, cadmium, and mercury on *Euglena* growth and pigments. *Z. Pflanzen. Physiol*. 101: 37-47
- Eastmond, D. A, J. T. MacGregor and R.S. Slesinski. 2008. Trivalent chromium: assessing the genotoxic risk of an essential trace element and widely used human and animal nutritional supplement. *Critical Reviews in Toxicology*. 38(3): 173-190
- El-Sheekh, M. M., A. H. El-Naggar, M. E. H. Osmas, and E. El-Mazaly. 2003. Effect of cobalt on growth, pigments and photosynthetic electron transport in *Monoraphidium minutum* and *Nitzschia perminuta*. *Braz.J.Plant physiol*. 15(3): 159-166.
- Fardiaz, S. 1992. *Polusi Air dan Udara*. Kanisius. Yogyakarta, hal: 190
- Gothberg, A. 2008. Metal fate and sensitivity in the aquatic tropical vegetable *Ipomea Aquatica*. Departement of Applied Enviromental Science. Stockholm University pp: 1 - 39.
- Guiry, M. D. 2015. *Chlorella pyrenoidosa* H.Chick, 1903. *In*: Guiry, M.D. & Guiry, G.M. (2015). *Algae Base*. World-wide electronic publication, National University of Ireland, Galway (taxonomic information republished from AlgaeBase with permission of M.D. Guiry). Accessed through: World Register of Marine Species at <http://www.marinespecies.org/aphia.php?p=taxdetails&id=578656> on 2017-03-27
- Hall, J.E. 2002. Bioconcentration, bioaccumulation, and biomagnification in puget sound biota: assessing the ecological risk of chemical contamination in puget sound. *NOAA, Technical Memorandum* p: 1-19.
- Haryoto dan A. Wibowo. 2004. Kinetika bioakumulasi logam berat kadmium oleh fitoplankton *Chlorella* sp. lingkungan perairan laut. *Jurnal Penelitian Sains dan Teknologi*. 5(2): 89-103.
- Hattum, B.V. 1995. Toxicokinetic and bioconcentration of polycyclic aromatic hydrocarbons in freshwater isopods.. *In* B.V. Hattum [ed.].

Bioaccumulation of sediment – bond contaminant by freshwater isopod *Asellus aquaticus* (L.). The Institute for Environmental Studies of Vrije Universiteit. p. 75 – 99.

Hörcsik, Z., V. Oláh, A. Balogh, I. Mészáros, L. Simon and G. Lakatos. 2006. Effect of chromium (VI) on growth, element, and photosynthetic pigment composition of *Chlorella pyrenoidosa*. 50(1-2): 19-23.

Iyer, G., Y. Gupte, P. Vaval, and V. Nagle. 2015. Uptake of potassium by algae and potential use as biofertilizer. *Ind J Plant Physiol*. 10(1007): 1-4.

Kusuma, R. W. A., dan E. Zulaika. 2014. Potensi *Chlorella* sp. sebagai bioakumulator logam berat kadmium. *Jurnal Sains dan Seni Pomits*. 3(2): 71-74.

Levy, J., B. Angel, J.L. Stauber, W.L. Poon, S. L. Simpson, S. Cheng, and D.F. Jolley. 2008. Uptake and internalisation of copper by three marine microalgae: Comparison of copper-sensitive and copper-tolerant species. *Aquatic Toxicology*. 89: 82-93.

Meisch, H., and I. Schmitt-Beckman. 1979. Influence of tri- and hexavalent chromium on two *Chlorella* strains. *Z. Pflanzenphysiol*, 94: 231-239

Miao, A., and W. Wan. 2007. Predicting copper toxicity with its intracellular or subcellular concentration and the thiol synthesis in a marine diatom. *Environmental Science Technology*. 4: 1777-1782.

Molazadeh, P., N. Khanjani, M. R. Rahimi, and A. Nasiri. 2015. Adsorption of lead by microalgae *Chaetoceros* sp. and *Chlorella* sp. from aqueous solution. *Journal of Community Health Research*. 4(2): 114-127.

Morreno-garrido, I., L. M. Lubian, and A. M. V. M. Soarest. 2000. Influence of cellular density on determination of EC₅₀ in microalgal growth inhibition tests. *Journal of Ecotoxicology and Environmental Safety*. 47: 112-116.

Muhaemin, M. 2004. Toxicity and bioaccumulation of lead in *Chlorella* and *Dunaliella*. *Journal of Coastal Development*. 8(1): 27-33

Napan, K., L. Teng, J. C. Quinn, and B. D. Wood. 2015. Impact of heavy metal from flue gas integration with microalgae production. *Algal Research*. 8: 83-88

Nobel, P.S. 2009. *Physiochemical and Environmental Plant Physiology*, Fourth Edition. Elsevier Academic Press. Oxford, p: 232-239.

Oilgae. 2003. *Oilgae Guide to Algae-based Wastewater Treatment*. C3B Anugraha Apartments. Tamilnadu, p: 6.

Oliveira, H. 2012. Chromium as an environment pollutant: insights on induced plant toxicity. Review Article. *Journal of Botany*. 1: 1-8.

- Pemerintah Indonesia. 2010. Peraturan Menteri Negara Lingkungan Nomor 1 Tahun 2010 tentang *Tata Laksana Pengendalian Pencemaran Air*. Sekretariat Negara. Jakarta.
- Pemerintah Indonesia. 2010. Peraturan Menteri Negara Lingkungan Nomor 3 Tahun 2010 tentang *Baku Mutu Air Limbah Bagi Kawasan Industri*. Sekretariat Negara. Jakarta.
- Plugaru, S., A. Sarb, T. Z. Horcsik, and T. Rusu. 2016. The effect of chromium on the growth of *Chlorella pyrenoidosa* algal culture. *Scientific Papers Series E. Land Reclamation, Earth Observation & Surveying, Environmental Engineering*. 5: 6-9.
- Qiming, Y., J. T. Matheickal, Y. Pinghe, and K. Pairat. 1999. Heavy metal uptake capacities of common marine macroalgal biomass. *Wat. Res.* 36(6): 1534-1537.
- Rashid, W. A., V. L.Wan, and M. H. Abdullah. 2009. Accumulation and depuration of heavy metals in the hard clam (*Meretrix meretrix*) under laboratory conditions. *Tropical Life Science Research*. 20(1): 17-24.
- Shanab, S., A. Essa, and E. Shalaby. 2012. Bioremoval capacity of three heavy metals by some microalgae species (Egyptian Isolates). *Plant Signalling & Behavior*. 7(3): 1-8.
- Shanker, A. K., C. Cervantes, H. Loza-Tavera, and S. Avudainayagam. Chromium toxicity in plants. Review Article. *Environmental International*.31: 739-753.
- Sharma, P. and R. S. Dubey. 2005. Lead toxicity in plants. *Brazilian Journal of Plant Physiology*. 17(1): 35-52.
- Taiz, L. and E. Zeiger. 2002. *Plant Physiology*, Third Edition. Sinauer Associates. Sunderland, p:113-115, 238.
- Wenny, D. D. R. and Aunorohim. 2013. Bioakumulasi logam berat kadmium (Cd) oleh *Chaetoceros calcitrans* pada konsentrasi sublethal. *Jurnal Sains dan Seni Pomits*. 2(2): 202-206.
- Widianarko, B. and N.V. Straalen. 1996. Toxicokinetic – based survival analysis in bioassay using nonpersistent chemical. *Environmental Toxicology and Chemistry* 15 : 402 – 406.
- Zhang, W., B. Xiong, L. Chen, K. Lin, X. Cui, H. Bi, M. Guo, and W.Wang. 2013. Toxicity assessment of *Chlorella vulgaris* and *Chlorella protothecoides* following exposure to Pb (II). *Environmental Toxicology and Pharmacology*. 36: 51-57.



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Zhang, Z. N. and J. S. Cui. 2015. The effects of Pb^{2+} stress on the growth and physiological characteristics of *Chlorella pyrenoidosa*. *Advanced Materials Research*. 1073-1076: 147-153