

BIORESOURCE POTENTIAL OF DUCKWEED IN AQUACULTURE PRACTICES: AN UPDATED BIBLIOMETRIC ANALYSIS THROUGH SCOPUS DATABASE

Parul Puri* ; Priyanka Puri**

*Assistant Professor,
Department of Zoology,
Maitreyi College, University of Delhi,
Delhi, INDIA
Email id: parul_acemail11@rediff.com

**Professor,
Department of Geography,
Miranda House, University of Delhi,
Delhi, INDIA
Email id: priyanka.puri@mirandahouse.ac.in

DOI:10.5958/2249-7137.2024.00018.8

ABSTRACT

Bioresources are of significance to humans as potential source of raw material, feedstock, for product and energy generation with economic and industrial viability. Duckweed known as 'water lentils', are surface, beneath surface floating plants in fresh and brackish water systems of Lemnaceae family. Duckweeds bestow remarkable bioresource potential to aquaculture practices in terms of sustainable feed, value added production and, energy generation (biofuels) with potential of bioremediation and waste-water treatment. This paper explores bibliometric collection of various works discussing the bioresource potential of duckweed in aquaculture practices. Astute linkages of China, India, US are visualized in terms of publications, citations and total link strength as top three contributors country wise. Organization wise Henan Province Engineering Research Center, China has maximum documents, citations and total linkage. Central themes observed through keywords and title field depict developing trends on the topic.

KEYWORDS: *Duckweed, Fish Feed, Protein Nutrition, Aquaculture, Bibliometric Analysis.*

REFERENCES

1. Alfiko, Y., Xie, D., Astuti, R.T., Wong, J., & Wang, L. (2022). Insects as a feed ingredient for fish culture: Status and trends. *Aquaculture and Fisheries*, 7: 166-178. <https://doi.org/10.1016/j.aaf.2021.10.004>
 2. Appenroth, K.J., Borisjuk, N., & Lam, E. (2013). Telling duckweed apart: Genotyping technologies for the Lemnaceae. *Chinese Journal of Applied and Environmental Biology*, 19 (1):1-10. <https://doi.org/10.3724/SP.J.1145.2013.00001>
 3. Baek, G.Y., Saeed, M., Choi, H.-K. (2021). Duckweeds: Their utilization, metabolites and cultivation. *Applied Biological Chemistry*, 64:73. <https://doi.org/10.1186/s13765-021-00644-z>
-

4. HLPE (2017). Nutrition and food systems. A report by the high level panel of experts on food security and nutrition of the committee on world food security, Rome.
5. Ingle, A.P., Philippini, R.R., Martiniano, S., Marcelino, P.R.F., Gupta, I., Prasad, S., & da Silva, S.S. (2020). Bioresources and their significance: Prospects and obstacles. In R. Katak, A. Pandey, S.K. Khanal and D. Pant (Eds.). Current developments in biotechnology and bioengineering sustainable bioresources for the emerging bioeconomy (pp. 3-40). Elsevier. <https://doi.org/10.1016/B978-0-444-64309-4.00001-5>
6. Irabor, A.E., Obakanurhie, O., Nwachi, F.O., Ekokotu, P.A., Ekelemu, J.K., Awhefeada, O.K., Adeleke, L.M., Pierre Jrn, H., & Adagha, O. (2022). Duckweed (*Lemna minor*) meal as partial replacement for fish meal in catfish (*Clarias gariepinus*) juvenile diets. Livestock Research for Rural Development. 34, Article #6. Retrieved December 16, 2024, from <http://www.lrrd.org/lrrd34/1/3406irabo.html>
7. Leng, R.A., Stambolie, J.H., & Bell, R. (1995). Duckweed - a potential high-protein feed resource for domestic animals and fish Livestock Res Rural Dev, 7(1) Article #5. Retrieved December 16, 2024, from <http://www.lrrd.org/lrrd7/1/3.htm>
8. Macusi, E.D., Cayacay, M.A., Borazon, E.Q., Sales, A.C., Habib, A., Fadli, N., & Santos, M.D. (2023). Protein fishmeal replacement in aquaculture: A systematic review and implications on growth and adoption viability. *Sustainability*, 15(16):12500. <https://doi.org/10.3390/su151612500>
9. Maulu, S., Langi, S., Hasimuna, O.J., Missinhoun, D., Munganga, B.P., Hampuwo, B.M., Gabriel, N.N., Elsabagh, M., Van Doan, H., Abdul Kari, Z., & Dawood, M.A.O. (2022). Recent advances in the utilization of insects as an ingredient in aquafeeds: A review. *Animal Nutrition*, 8(11):334-349. <https://doi.org/10.1016/j.aninu.2022.07.013>.
10. Minich, J.J., & Michael, T.P. (2024). A review of using duckweed (Lemnaceae) in fish feeds. *Reviews in Aquaculture*, 16(3): 1212-1228. <https://doi.org/10.1111/raq.12892>
11. Muradov, N., Taha, M., Miranda, A.F., Kadali, K., Gujar, A., Rochfort, S., Stevenson, T., Ball, A.S., & Mouradov, A. (2014). Dual application of duckweed and *Azolla* plants for wastewater treatment and renewable fuels and petrochemicals production. *Biotechnology for Biofuels*, 7, 30. <https://doi.org/10.1186/1754-6834-7-30>
12. Naylor RL, Hardy RW, Bureau DP, Chiu A, Elliott M, Farrell AP, Forster I, Gatlin DM, Goldburg RJ, Hua K, Nichols PD (2009). Feeding aquaculture in an era of finite resources. *Proceedings of the National Academy of Sciences USA* 106 (36): 15103-15110.
13. NRC National Research Council (1993). Nutrient Requirements of Fish. Subcommittee on Fish Nutrition. <http://www.nap.edu/catalog/2115.html>
14. NOAA (2015). Bibliometrics and research evaluation: Network analysis. Retrieved September 19, 2024. <https://libguides.library.noaa.gov/bibliometrics>
15. Pleić, I.L., Bušelić, I., Messina, M., Hrbar, J., Žuvić, L., Talijančić, I., Žužul, I., Pavelin, T., Anđelić, I., Pleadin, J., Puizina, J., Grubišić, L., Tibaldi, E., & Šegvić-Bubić, T. (2022). A plant-based diet supplemented with *Hermetia illucens* alone or in combination with poultry

by-product meal: One step closer to sustainable aquafeeds for European seabass. *Journal of Animal Science and Biotechnology*, 13:77. <https://doi.org/10.1186/s40104-022-00725-z>

16. Scopus (2024). Retrieved September 19, 2024. <https://scopus.duelibrary.in/search/form.uri?display=basic#basic>
17. Stadtlander, P.T., Tschudi, F., Seitz, A., Sigrist, M., Refardt, D., & Leiber, F. (2023). Partial replacement of fishmeal with duckweed (*Spirodela polyrhiza*) in feed for two carnivorous fish species, Eurasian Perch (*Perca fluviatilis*) and rainbow trout (*Oncorhynchus mykiss*). *Aquaculture Research*, 6680943, <https://doi.org/10.1155/2023/6680943>
18. Woodgate, S. L., Wan, A. H. L., Hartnett, F., Wilkinson, R. G., & Davies, S. J. (2022). The utilisation of European processed animal proteins as safe, sustainable and circular ingredients for global aquafeeds. *Reviews in Aquaculture*, 14(3):1572-1596. <https://doi.org/10.1111/raq.12663>
19. WRI, World Resources Institute (2013). *Creating a sustainable food future: A menu of solutions to sustainably feed more than 9 billion people by 2050*. World Resources Report 2013-2014: Interim Findings, Washington, US.
20. Xu, J., Shen, Y., Zheng, Y., Smith, G., Sun, X.S., Wang, D., Zhao, Y., Zhang, W., & Li, Y. (2021). Duckweed (Lemnaceae) for potentially nutritious human food: A review. *Food Reviews International*, 39(7): 3620 - 3634. <https://doi.org/10.1080/87559129.2021.2012800>