Document details

‹ Back to results | 1 of 1

Export Download Print E-mail Save to PDF Add to List More... ›

Malaysian Applied Biology
Volume 49, Issue 1, June 2020, Pages 23-29

Optimum salinity level for the cultivation of ciliated protozoa (Article)

Mukai, Y.[a,b], Shahidin, S.H.M.[c], Noor, N.M.[a,b]

[a]Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang 25200, Malaysia
[b]Institute of Oceanography and Maritime Studies (INOCEM), Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang 25200, Malaysia
[c]Department of Biotechnology, Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang 25200, Malaysia

Abstract

View references (30)

In the present study, protozoa was cultured in different salinity water (10%, 20% and 30%) to determine the optimum salinity level required for the culturing. We examined the densities of protozoa and the ciliates Euplotes spp. in a general culture and Euplotes encysticus Yonezawa in a separate monoculture. Various species of protozoa were observed in the culture water, with a peak density of 30,000–40,000 cells ml^{-1} on day 4. The density of Euplotes spp. in the culture water increased with elapsed days, peaking on day 3. One-way analysis of variance showed a significant difference in the densities on day 3, and post-hoc Tukey–Kramer test results showed that the density at 10% was significantly higher than that at 30%. The E. encysticus monoculture peaked at 5000–6000 cells ml^{-1}, but there was no significant difference between the salinity levels. Although our results are not definitive, the lower salinity level appeared most suitable for culturing protozoa. The ciliated protozoa Euplotes spp. in the current study were smaller than 100 µm, and they may be suitable size as live feed as starter diet for marine fish larvae with small mouth openings.

Author keywords

Ciliates | Euplotes encysticus | Protozoa | Salinity | Starter live feed

Funding details

Funding sponsor	Funding number	Acronym
	FRGS/ 2/2014/SG03/ UIAM/02/2,FRGS/1/2017/ STG03/UIAM/02/1	
Ministry of Higher Education, Malaysia		MOHE

Funding text

We express sincere thanks to Miss Nur Al Mardhiah Yazid for the technical assistance. This study was supported by Fundamental Research Grants (FRGS/ 2/2014/SG03/ UIAM/02/2 and FRGS/1/2017/ STG03/UIAM/02/1) from Ministry of Higher Education Malaysia.

ISSN: 01268643
Source Type: Journal
Original language: English
Document Type: Article
Publisher: Malaysian Society of Applied Biology

References (30)

View in search results format >

All | Export | Print | E-mail | Save to PDF | Create bibliography

1 Bone, Q., Marshall, N.B., Blaxter, J.H.S.
(1996) *Biology of Fishes*, p. 332. Cited 546 times.
Chapman & Hall, London

2 Corliss, J.O.
(1979) *The Ciliated Protozoa: Characterization, Classification and Guide to the Literature*, p. 472. Cited 873 times.
2nd editions. Pergamon Press, Oxford

3 de Côrtes, G.F., Tsuzuki, M.Y.
Effect of different live food on survival and growth of first feeding barber goby, Elacatinus figaro (Sazima, Moura & Rosa 1997) larvae
(2012) *Aquaculture Research*, 43 (6), pp. 831-834. Cited 10 times.
doi: 10.1111/j.1365-2109.2011.02896.x
View at Publisher

4 Crosbie, P.B.B., Munday, B.L.
Environmental factors and chemical agents affecting the growth of the pathogenic marine ciliate Uronema nigricans (Open Access)
(1999) *Diseases of Aquatic Organisms*, 36 (3), pp. 213-219. Cited 26 times.
http://www.int-res.com/journals/dao/dao-home/
doi: 10.3354/dao036213
View at Publisher

5 Curds, C.R., Vandyke, J.M.
The feeding habits and growth rates of some fresh-water ciliates found in activated-sludge plants
(1966) *Journal of Applied Ecology*, 3, pp. 127-137. Cited 51 times.

6 Das, P., Mandal, S.C., Bhagabati, S.K., Akhtar, M.S., Singh, S.K.
Important live food organisms and their role in aquaculture
(2012) *Frontiers in Aquaculture*, pp. 69-86. Cited 35 times.
M. Sukham (Ed). Narendra Publishing House, Delhi

7 Doi, M., Ohno, A., Kohno, H., Taki, Y., Singhagraiwan, T.
Development of Feeding Ability in Red Snapper Lutjanus argentimaculatus Early Larvae
(1997) *Fisheries Science*, 63 (6), pp. 845-853. Cited 13 times.
http://www.springer.com/life+sci/zoology/journal/12562?detailsPage=contactPublishing
doi: 10.2331/fishsci.63.845
View at Publisher

8 Doi, M., Ohno, A., Taki, Y., Singhagraiwan, T., Kohno, H.
Nauplii of the calanoid copepod, Acartia sinjiensis as an initial food organism for larval red snapper Lutjanus argentimaculatus
(1997) *Aquaculture Science*, 45, pp. 31-40. Cited 17 times.

9 De Figueiredo, G.M., Nash, R.D.M., Montagnes, D.J.S.
The role of the generally unrecognised microprey source as food for larval fish in the Irish Sea

(2005) *Marine Biology*, 148 (2), pp. 395-404. Cited 50 times.
doi: 10.1007/s00227-005-0088-0

View at Publisher

10 De Figueiredo, G.M., Nash, R.D.M., Montagnes, D.J.S.
Do protozoa contribute significantly to the diet of larval fish in the Irish Sea?

(2007) *Journal of the Marine Biological Association of the United Kingdom*, 87 (4), pp. 843-850. Cited 51 times.
doi: 10.1017/S002531540705713X

View at Publisher

11 Fukami, K., Watanabe, A., Fujita, S., Yamaoka, K., Nishijima, T.
Predation on naked protozoan microzooplankton by fish larvae (Open Access)

(1999) *Marine Ecology Progress Series*, 185, pp. 285-291. Cited 77 times.
http://www.int-res.com/journals/meps/meps-home/
doi: 10.3354/meps185285

View at Publisher

12 Hagiwara, A., Wullur, S., Marcial, H.S., Hirai, N., Sakakura, Y.
Euryhaline rotifer Proales similis as initial live food for rearing fish with small mouth

(2014) *Aquaculture*, 432, pp. 470-474. Cited 25 times.
www.elsevier.com/inca/publications/store/5/0/3/3/0/2
doi: 10.1016/j.aquaculture.2014.03.034

View at Publisher

13 Imai, C., Tanaka, S.
Effect of Sea Water Temperature on Egg Size of Japanese Anchovy (Open Access)

(1987) *NIPPON SUISAN GAKKAISHI*, 53 (12), pp. 2169-2178. Cited 24 times.
doi: 10.2331/suisan.53.2169

View at Publisher

14 Kaneshiro, E.S., Dunham, P.B., Holz, J.R.G.G.
Osmoregulation in a marine ciliate, Miamiensis avidus, I. regulation of inorganic ions and water
(1969) *Biological Bulletin*, 136, pp. 63-75. Cited 22 times.

15 Kitani, K.
Cultivation and utilization of a ciliated protozoa Infusoria
(1989) *Aquacultue Science*, 36, pp. 307-320.

16 Koiso, M., Hino, A.
Effects of salinity on population growth, nutritive value and feeding cost of the enriched rotifer, Brachinous plicatilis
(2001) *Aquaculture Science*, 49, pp. 41-46. Cited 2 times.

17 Kurita, Y., Fujinami, Y., Amano, M.

The effect of temperature on the duration of spawning markers-migratory-nucleus and hydrated oocytes and postovulatory follicles- in the multiple-batch spawner Japanese flounder (Paralichthys olivaceus)

(2011) *Fishery Bulletin*, 109 (1), pp. 79-89. Cited 25 times.
http://fishbull.noaa.gov/1091/kurita.pdf

View at Publisher

18 Madhu, K., Madhu, R.

Captive spawning and embryonic development of marine ornamental purple firefish Nemateleotris decora (Randall & Allen, 1973)

(2014) *Aquaculture*, 424-425, pp. 1-9. Cited 12 times.
doi: 10.1016/j.aquaculture.2013.12.027

View at Publisher

19 Afandi, M.M., Waludin, S.N., Noor, N.M., Phang, I.C., Kadowaki, S., Mukai, Y.

Identification of euplotes encysticus a starter live feed for marine fish larvae based on morphology and molecular sequences

(2018) *Malaysian Applied Biology*, 47 (3), pp. 175-180.
http://www.mabjournal.com/images/47_3_June_2018/47_03_24.pdf

20 Mukai, Y., Sani, M.Z., Mohammad-Noor, N., Kadowaki, S.
Effective method to culture infusoria, a highly potential starter feed for marine finfish larvae
(2016) *International Journal of Fisheries and Aquatic Studies*, 4, pp. 124-127. Cited 4 times.

21 Mieczan, T.

Size spectra and abundance of planktonic ciliates within various habitats in a macrophyte-dominated lake (Eastern Poland)

(2007) *Biologia*, 62 (2), pp. 189-194. Cited 21 times.
doi: 10.2478/s11756-007-0028-1

View at Publisher

22 Montagnes, D.J.S., Dower, J.F., Figueiredo, G.M.

The protozooplankton-ichthyoplankton trophic link: An overlooked aspect of aquatic food webs

(2010) *Journal of Eukaryotic Microbiology*, 57 (3), pp. 223-228. Cited 51 times.
doi: 10.1111/j.1550-7408.2010.00476.x

View at Publisher

23 Nagano, N., Iwatsuki, Y., Kamiyama, T., Shimizu, H., Nakata, H.

Ciliated protozoans as food for first-feeding larval grouper, Epinephelus septemfasciatus: Laboratory experiment

(2000) *Plankton Biology and Ecology*, 47 (2), pp. 93-99. Cited 30 times.

24 Nagano, N., Iwatsuki, Y., Kamiyama, T., Nakata, H.

Effects of marine ciliates on survivability of the first-feeding larval surgeonfish, Paracanthurus hepatus: Laboratory rearing experiments

(2000) *Hydrobiologia*, 432 (1-3), pp. 149-157. Cited 45 times.
https://link.springer.com/journal/10750
doi: 10.1023/a:1004094825739

View at Publisher

25 Olivotto, I., Zenobi, A., Rollo, A., Migliarini, B., Avella, M., Carnevali, O.
Breeding, rearing and feeding studies in the cleaner goby Gobiosoma evelynae

(2005) *Aquaculture*, 250 (1-2), pp. 175-182. Cited 60 times.
doi: 10.1016/j.aquaculture.2005.02.057

View at Publisher

26 Rhodes, M.A., Phelps, R.P.
Ciliated protozoans as alternative live food for first feeding red snapper, Lutjanus campechanus, larvae
(2006) *Proceedings of 57 Annual Gulf Caribbean Fisheries Institute*, pp. 963-973. Cited 2 times.
R.L. Creswell (Ed)

27 Tucker, J.R.J.W.
(1998) *Marine Fish Culture*, p. 750. Cited 149 times.
Kluwer Academic Publishers, Massachusetts

28 Winter, F., De Persoone, G.
Preliminary experiments with the ciliate Fabrea salina as a potential live food for mariculture
(1975) *10th European Symposium on Marine Biology*, pp. 37-48. Cited 11 times.
Ostend, Belgium

29 Walford, J., Lim, T.M., Lam, T.J.
Replacing live foods with microencapsulated diets in the rearing of seabass (Lates calcarifer) larvae: do the larvae ingest and digest protein-membrane microcapsules?

(1991) *Aquaculture*, 92 (C), pp. 225-235. Cited 76 times.
doi: 10.1016/0044-8486(91)90024-2

View at Publisher

30 Zingel, P., Paaver, T., Karus, K., Agasild, H., Nõges, T.
Ciliates as the crucial food source of larval fish in a shallow eutrophic lake

(2012) *Limnology and Oceanography*, 57 (4), pp. 1049-1056. Cited 18 times.
http://www.aslo.org/lo/pdf/vol_57/issue_4/1049.pdf
doi: 10.4319/lo.2012.57.4.1049

View at Publisher

Mukai, Y.; Department of Marine Science, Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang, Malaysia; email:mukai@iium.edu.my
Mukai, Y.; Institute of Oceanography and Maritime Studies (INOCEM), Kulliyyah of Science, International Islamic University Malaysia, Jalan Sultan Ahmad Shah, Bandar Indera Mahkota, Kuantan, Pahang, Malaysia; email:mukai@iium.edu.my

Back to results | 1 of 1

Top of page