

Effects of algal concentration and initial density on the population growth of *Diaphanosoma celebensis* Stingelin (Crustacea, Cladocera)*

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Abstract The effects of algal concentration and initial density on the population growth of the estuarine cladocera, *Diaphanosoma celebensis* Stingelin, were evaluated in an indoor experiment. A 2 × 4 layout that included two algal concentrations (*Chlorella pyrenoidosa*, 1 × 10⁶ and 3 × 10⁶ cell/mL) and four inoculation densities (100, 200, 300 and 400 ind./L) were established. *Diaphanosoma celebensis* were reared in 150 mL flasks containing 50 mL of algal medium at 22°C, under salinity of 10 and a photoperiod of 12 h L: 12 h D. The lag phase required to initiate continuous population growth following inoculation was shorter for *D. celebensis* fed 1 × 10⁶ cell/mL and inoculated at 300 or 400 ind./L than that for *D. celebensis* fed 3 × 10⁶ cell/mL and inoculated at 100 or 200 ind./L. However, *D. celebensis* fed 3 × 10⁶ cell/mL and inoculated at 100 or 200 ind./L exhibited longer periods of positive population growth. The maximum population densities were 5 875 ± 324, 6 690 ± 691, 7 735 ± 1,121 and 6 365 ± 691 ind./L for *D. celebensis* fed 1 × 10⁶ cell/mL and inoculated at 100, 200, 300 and 400 ind./L, respectively, and 15 070 ± 379, 12 215 ± 648, 11 960 ± 2,551 and 16 130 ± 880 ind./L for *D. celebensis* fed 3 × 10⁶ cell/mL and inoculated at 100, 200, 300 and 400 ind./L, respectively. The average daily increasing rates of population were 0.076 ± 0.001, 0.065 ± 0.002, 0.055 ± 0.002 and 0.048 ± 0.003 for *D. celebensis* fed 1 × 10⁶ cell/mL and inoculated at 100, 200, 300 and 400 ind./L, respectively, and 0.098 ± 0.001, 0.078 ± 0.002, 0.072 ± 0.003 and 0.067 ± 0.003 for *D. celebensis* fed 3 × 10⁶ cell/mL and inoculated at 100, 200, 300 and 400 ind./L, respectively. The maximum population density and average daily increasing rate of population increased as the algal concentration increased, whereas an increase in the inoculation density led to a linear decrease in the daily increasing rate of population under both algal concentrations. The results of the present experiment indicate that the algal concentration and inoculation density significantly affect population growth of *D. celebensis*. Furthermore, the results suggest that the optimal algal concentration and inoculation density for the mass culture of *D. celebensis* should be 3 × 10⁶ cell/mL and 100 ind./L.

Keyword: *Diaphanosoma celebensis*; population growth; algal concentration; inoculation density

1 INTRODUCTION

Cladocera, which are a major component of freshwater zooplankton, are an excellent natural food source for aquatic animals such as finfish and shellfish, and are widely used as live food in freshwater fish hatcheries. However, there are few species of cladoceran in ocean and inland saline lakes. Indeed, only eight species of cladocerans, *Penilia avirostris*, *Podon intermedius*, *P. leuckarti*, *P. schmackeri*, *P. polyphemoides*, *Evadne nordmanni*, *E. spinifera* and *E. tergestina*, are considered to be true marine cladocera (Zheng et al., 1987). In addition, Hammer

(1986) identified five species of cladoceran that occurred in hypersaline waters (salinity > 30), *Daphnia similis*, *Daphniopsis pusilla*, *Moina hutchinsoni*, *M. microcephala*, and *M. mongolica*, as well as nine species that were tolerant of mesosaline waters (salinity 20 to 30), *Daphnia atkinsoni*, *D. magna*, *D. dolichocephala*, *Daphniopsis australis*, *Macrothrix hirsuticornis*, *Moina brachiata*, *M. baylyi*, *M. macrocopa* and *Scaphaloberis mucronata*. It is

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