The effect of salinity on the reproductive characteristics of parthenogenetic *Artemia* from South Africa

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Abstract

Separate cohorts of *Anemia* were reared in medium with salinities of 50, 75 and 100 g NaCll-[1] to determine the influence of salinity on reproductive strategies. *Artemia* grown at salinity of 50 *%-l'* produced a mean of 356,1 (SD 73,17) progeny each, with 67,3% as cysts. The mean number of progeny produced at a salinity of 75 *g-l'* was 957,6 (SD 583,3), of which 2% were cysts, and at 100 *g-l* it was 49,6 (SD 32) with 16% as cysts.

Introduction

The salinity tolerance of *Artemia* is well known. Persoone and Sorgeloos (1980) reported that it can survive at salinities ranging from almost zero to water supersaturated with NaCl. However, in practice the lowest salinity in which *Artemia* occurs naturally corresponds with the highest salinity tolerated by its predators. Bowen et al. (1985) showed that although various strains of *Artemia* tolerate a wide range of salinities, the dominant anion influenced survival, as organisms from a habitat where chloride was dominant were unable to survive in a medium high in carbonate, and vice versa.

There are a number of small, temporary salterns in the semi-arid regions of South Africa, some supporting small saltworks (Mitchell and Seaman, 1988). The dominant anion in the salterns in this area is chloride (Hugo, 1974). Brine for the saltworks is pumped from boreholes or pits in the salterns, many of which have no surface water for most of the year. While the salterns themselves offer an ephemeral habitat, the saltworks are both permanent and have generally stable salinities in the evaporating pans.

The present study investigated the life cycle and reproductive characteristics of the parthenogenetic strain of *Artemia* in the salterns of the Western Orange Free State and the Northern Cape Province of South Africa, in order that these parameters may be compared with those of *Artemia* from other localities as listed by Browne et al. (1984).

Materials and methods

Stock cultures of *Artemia* were held in aerated medium at a salinity of 50 g NaCl l' of salt obtained from a saltworks near Bloemfontein where *Artemia* occurs naturally. The dominant anion in this salt is chloride. For each experiment a number of females about to release nauplii were isolated and held overnight in medium of the required salinity. The following morning the mature females were replaced in the stock culture, and some of the released nauplii were used experimentally. Thus, the age of the organisms used in each experiment was known within 8 h.

Each cohort consisted of 25 organisms held individually in petri dishes (100 mm dia.) containing 50 *ml* of unaerated medium. The medium was replaced daily and contained sufficient *Chlorella* cells to feed the organisms for 24 h. Each organism was checked daily and the number of nauplii and cysts were recorded.

Reproductive characteristics were recorded for organisms surviving to maturity (Tables 1 to 3).

The organisms used in the experiment were fed on the *Chlorella* sp. cultured in the laboratory using dried cattle manure (1 *g-l')* supplemented by urea (100 mg-l') as the source of nutrients. The salinity of the algal medium was adjusted to the appropriate level before being added to the higher salinity treatments. Both the experimental animals and the stock cultures were held at 22°C ± 1°C.

The effect of three salinities (50, 75 and 100 g NaCl-l') on the life cycle and reproductive characteristics of *Artemia* was investigated. The differences in the means and standard deviations for each characteristic measured for the organisms in each of the three treatments were tested for significance by ANOVA. Where differences were found to be significant, the means of the individual treatments were tested against each other by the method of standard error between two means.

Results

Survival and life cycle characteristics

Approximately 60% of the organisms survived to sexual maturity in each of the three salinities tested, and the number surviving did not differ significantly between the treatments.

The longevity of *Artemia* during different phases of their life cycles in the three treatments (Table 1) was tested by ANOVA, and significant (at pO,O5) differences were found for all but the post-reproductive phase (Table 2).

The *Artemia* grown at 75 g NaCl-l' spent significantly longer in all phases of the life cycle except the post-reproductive period than those grown at either 50 or 100 g NaClY". The mean duration of the reproductive period for the organisms grown in the medium at 100 *g-l*[1] was so short because 73% of the organisms in this treatment produced only one brood of offspring before dying, and none produced more than two broods. Organisms in this treatment died very soon after their final brood.

Reproductive characteristics

The total production of offspring, as well as the production of nauplii was highest at 75 g NaCl-l' (Tables 1 and 3). The trend of

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