THE IMPACT OF TEMPERATURE AND SALINITY ON THE VOLUME OF THE ROTIFER *BRACHIONUS PLICATILIS* O.F. MULLER UNDER LABORATORY CONDITIONS

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Abstract

We tried to rear rotifers of different size fractions, kept at controlled, sea water temperatures and salinities and fed with the unicellular algae *Nannochloropsis* sp., by combining three temperatures and three salinities in nine different ways. Observations on the growth and volume of the rotifers lasted ten days. Rotifers reared at 22° C and 20 ‰S averaged 758692 mm^3 (SD-+199504 μm^3), while those reared at 34° C and 35 ‰S averaged 425358 μm^3 (SD- +152530 μm^3). The ANOVA one way analysis of variance showed different results between the groups of rotifers (P<0.05), thus, we can conclude that higher temperatures and salinities influence rotifers by decreasing body volume.

Key-words : aquaculture, plankton, biometrics, larvae

Introduction

The rotifer *Brachionus plicatilis* O.F. Muller, since it was first used as fish larvae food in the 60-ties (1), is one of the most frequently used food organisms in the artificial rearing of larval fish and crustaceans. This organism was a favourite in live food production, due to its simple, mass rearing, fast reproduction, short generation time, and relatively high nutritional value. Also, the advantages of its euryhaline and eurytherm properties allow it to be reared under a variety of natural conditions, broadening its range of applications.

The food intake process is relatively complex in fish larvae. The conversion rate depends not only on available food quantities and their qualitative composition, but also on the size of the prey or food particle. Prey size is related to the mouth size of fish larvae (2, 3), and does not in average surpass 38% of mouth of the larvae (4, 5, 6) claim that prey size for fish larvae increases with the increase in larvae size. Thus, in artificial rearing, there is a need for rotifers of different size fractions, in order to successfully meet the nutritional needs of several larval fish. The aim of this experiment was to estimate the influence of temperature and salinity on the body structure of rotifers. Information on the possible effects of mentioned abiotic conditions is given by Fukusho (7, 8), who report that in populations of *Brachionus plicatilis* found in natural ecosystems, S (small)-type individuals predominate in the summer and L (large)-type individuals during the lower, winter temperatures.

This paper displays the preliminary results based on experiments concerning the synergistic effects of temperature and salinity on the body volume of rotifers under controlled, laboratory conditions. We tried to discover how different combinations of temperature and salinity influence the body volume of rotifers in rearing conditions.

Material and methods

We reared rotifers in 30 l plastic containers, filled with 15 l of sea water, with medium aeration. We fed them with unicellular planctonic algae *Nannochloropsis* sp., maintained at a constant concentration of 1,2-1,5 x 10-6 ml. The sea water used was taken from the aquarium system, located near our laboratory, from a depth of 8 m. The salinity of the sea water was 35 ‰S and the temperature 18° C. Prior to its use, the sea water was filtered through three mechanical filters (10,5 and 1 μm) and was sterilized by means of a flow through UV lamp. In the thermostatic chamber, in which the experiment was conducted, the temperature was maintained at a constant 22° C and the photoperiod was 12/12 (light/darkness).

The influence of different temperatures and salinities was examined in three separate experiments. In each experiment, rotifers were reared under different temperatures and salinities. The temperatures were constantly maintained by using aquarium, ceramic heaters with a thermostat (SICCE model RTR 25/300W) and the salinity was kept constant by mixing sea and tap water. The experiments were conducted from November 20 to December 23, 1995, each experiment lasting ten days.

During the first five days, rotifers were nurtured to achieve a satisfactory growth and to reach a constant phase of population. Between the fifth and the tenth day, measurements were taken of the length and width of the lorica. Rotifer samples were taken every day for measurement and were examined under the binocular microscope WILD HERRBRUG Typ 325400, and the results were automatically printed using WILD HERRBRUG MMS 325. 100 individuals were measured per container. We obtained rotifers for measurement by filtering 0.25 l of suspension through a plancton net of 53 um.

The volume was calculated according to Ruttner-Kollisko (9), simplified formula : V = 0.12 x a3

where body volume, a = length of lorica and 0.12 = coefficient.

The data on the body volume was statistically computed using the ANOVA one way analysis of variance in the Statgrapher *vs.* 2.6 programme, and SD was computed in the 2 D Graphing programme.

Results

Figures 1, 2 and 3 show changes in the average body volume of rotifers and Table 1 shows the numerical values. The average values, measured every day, did not change considerably throughout the experiment, but it is evident that there is a difference in the body volume of rotifers kept at the same salinities, but at different temperatures (Fig. 1, 2, 3). The differences between the groups are most obvious in the second experiment (Figure 2), with the following average values of body volume : 647 840 μm3 at 27 ‰S and 22° C ; 520 590 μm3 at 27 ‰S and 28° C ; and 421 410 μm3 at 27 ‰S and 34° C. The greatest difference in body volume can be found between the group at 35 S and 34° C, with V =758 692 μm3, and the group at 20‰ S and 22° C, with V = 425 358 μm3, which is only 56.65% of the first, greatest value. The ANOVA one way analysis of variance showed three, clearly divided size fractions of rotifers (P<0.05). The first consisted of four groups : 9, 8, 7 and 6, with smaller rotifers (Figure 2). The second

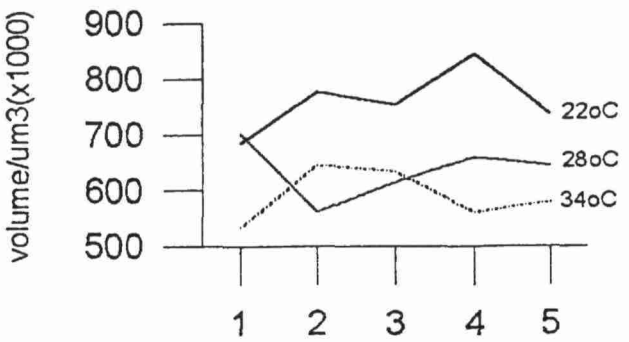

Figure 1. Body volume of rotifers during Experiment 1, at 20‰S.

Table 1. Average body volume of rotifers an SD given for each combination of temperature and salinity (V/μm^3 and SD x 1000).

Groups	S‰/t°C	V/μm^3	SD
1	20/22	758	±199
2	20/28	636	±159
3	20/34	590	±133
4	27/22	638	±177
5	27/28	549	±168
6	27/34	439	±140
7	35/22	446	±195
8	35/28	455	±169
9	35/34	425	±152