Different cultivation methods for production of rotifers

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Rotifer production - rotifer strains

Different rotifer species and strains:
- Different size
- Different optimum growth conditions
  - Temperature
  - Salinity
- Different growth rate
- Different nutritional content
  - Food quality and quantity

Foto: Pekarsky
Growth and survival of cod larvae fed *Brachionus nevada* or *Brachionus cayman*

<table>
<thead>
<tr>
<th>Results</th>
<th>Large-Normal</th>
<th>Small-Normal density</th>
<th>Small-High density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survival day 45 (% ± SE)</td>
<td>37±1</td>
<td>33±2</td>
<td>34±1</td>
</tr>
<tr>
<td>Growth rate day 5-10 (% day⁻¹)</td>
<td>8.9</td>
<td>-0.06</td>
<td>3.3</td>
</tr>
<tr>
<td>Growth rate day 5-17 (% day⁻¹)</td>
<td>10.6</td>
<td>5.9</td>
<td>8.9</td>
</tr>
<tr>
<td>Biomass, day 35 (µg DW larva⁻¹)</td>
<td>1335</td>
<td>1074</td>
<td>1157</td>
</tr>
</tbody>
</table>

Øie, Overrein, Olsen, Kui, & Reitan, 2003
Rotifer production-cultivation technique

- Batch cultivation
- Semi-continuous cultivation
- Recirculation
- Without water flowthrough
- With water flowthrough

Production tanks:
- 100 litre - 300,000 litre

Culture conditions:
- Water quality
  - pH 7.5-8.5
  - Ammonia <1 mg l⁻¹
  - Aeration and oxygen >4ppm
- Organic particles
- Bacteria and other organisms

(Data from Støttrup and McEvoy: Live feed in marine aquaculture)
Batch cultivation of rotifers

Control:
- Rotifer density, eggratio
- Continuous feeding
- Oxygen
- Temperature
- Salinity

Growth for 3-5 days

Washing

Enrichment

Washing and storage/feeding
Rotifer production in Lofilab

Cod production with copepods and rotifers

• Rotifer production in 4m³ bags
• Batch production in 4 days (300 ind/ml to 1000 ind/ml)
• Continuous feeding with yeast and Algamac 2000
Production of rotifer with *Chlorella* in Japan

- Two days production cycles
- 0.1 µm filtered water
- Addition of HCl (pH control)
- Addition of pure oxygen
- Short-term enrichment
- Densities in lab. scale are 150 000 ind/ml
- Normal densities of “small” rotifers are 10-25 000 ind/ml
- Normal densities of “big” rotifers are 2-3000 ind/ml

(Yoshimura et al, 1996)
Rotifer production in Fosen Aquasenter

Rotifer production:
• Batch cultivation
• Semi-continuous production
• Semi-continuous production in a recirculation system
Semi-continuous production in Fosen Aquasenter

- Rotifer production (culture volume 1.8 m$^3$)
- Cleaning arm in the bottom of the tank
- 20-30% harvesting per day
- Yeast, Clorella, vitamins and oil
- Daily production: 2.5 billion per tank

Inside the rotifer tank after 20 days cultivation. Cleaning arm in bottom of the tank.
Production of rotifer in a recirculation system

Fig. 1. Schematic overview of the recirculation system used for high-density rotifer production. PP: peristaltic pump, AW: air–water lift, F: nylon filter, SH: submerged heater, P: pump.

(Suantika et al. 2003)
Production of rotifer in a recirculation system

(Rainuzzo and Kjøsnes, 2005)
Rotifer counting by camera

M. Alver, T. Tennøy, G. Øie and J.A. Alfredsen, unpublished
User interface
Rotifer density in production tanks with different rotifer density
Monitoring the rotifer density in fishtanks

(Alver, Alfredsen and Øie, unpublished data)
What is important in high density rotifer production in the future?

- Monitoring and automatic regulation of:
  - Oxygen
  - pH
  - NH₃
  - Salinity and temperature

- Automatic counting
  - Rotifer density
  - Eggratio
  - Swimming velocity

- Procedures for cleaning tanks

- Microbial control