Dr. Ana Milstein
Agricultural Research Organization-ARO
Aquaculture Department
Fish & Aquaculture Research Station, Dor
M.P. Hof HaCarmel
30820 ISRAEL

Phone: +972 4 6390651 ext 23
Fax: +972 4 6390652
E-mail: anamilstein@int.gov.il
http://www.agri.gov.il/People/AnaMilstein.html
Organic Tilapia Culture in Israel

Ana Milstein\(^1\) and Omri Lev\(^2\)

\(^1\) Fish & Aquaculture Research Station, Dor.
\(^2\) Kibbutz Geva Fish Farm.
demand of ‘healthy’ foods
environmental concern

public pressure

World 'Organic' Retail Market

(year)

billion U$

(1997) 10

(2000) 20

(2008) 70

(Estimated growth rate: about 18 % per year (world average))
Organic aquaculture

- Cold water species: mainly salmonids
- Warm water species: shrimps, tilapia
Basis of ‘organic’ aquaculture production

- maintenance of the aquatic environment and surrounding ecosystems
- reduce environmental impact of effluents and wastes
- encouraged use of by-products and waste materials as feed source
- enhancement of biological cycles in production units
Basis of ‘organic’ aquaculture production

- reduced stocking density
- prohibition of genetically modified organisms (GMO)
- prohibition of synthetic fertilizers
- prohibition of hormones
- avoidance of chemotherapeutic agents
- promotion of polyculture when applicable
‘Organic’ fishpond at Geva fish farm (3.5 ha)

- ‘Organic’ manure & feed
- Nutrients
- ‘Organic’ fishpond
- GMO
- Environment

- Grass carp
- Bighead carp
- Silver carp
- Tilapia
- Red drum
- Mullet
- Common carp

Nutrients

GMO

Environment
## Commercial organic tilapia production in Israel
Geva fish-farm, 1 pond of 3.5 ha, years 2000-2003

<table>
<thead>
<tr>
<th>Fish</th>
<th>Stocking (number/ha)</th>
<th>Observations</th>
<th>Harvesting (ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>tilapia</td>
<td>8,000-12,000</td>
<td>80-90% of fish</td>
<td>5-13</td>
</tr>
<tr>
<td>mullet</td>
<td>1,500 in 2000-2001</td>
<td>temp&gt;30°C surv 50%</td>
<td>2-3</td>
</tr>
<tr>
<td>common carp</td>
<td>✓</td>
<td>restocked each year</td>
<td>✓</td>
</tr>
<tr>
<td>black carp</td>
<td>✓</td>
<td>restocked each year</td>
<td>✓</td>
</tr>
<tr>
<td>grass carp</td>
<td>✓</td>
<td>restocked each year</td>
<td>✓</td>
</tr>
<tr>
<td>silver carp</td>
<td>✓</td>
<td>restocked each year</td>
<td>✓</td>
</tr>
<tr>
<td>red-drum</td>
<td>500</td>
<td>5% of fish, 6g at st.</td>
<td>0.3</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>11,000-14,000</strong></td>
<td></td>
<td><strong>9-20</strong></td>
</tr>
<tr>
<td>wild tilapia spawning</td>
<td></td>
<td>reduced since 2001: cross of genetic lines that give less females</td>
<td>3 → 1</td>
</tr>
</tbody>
</table>
‘Organic’ tilapia production problem: wild spawning

Tilapia wild spawning → Pradator fish
Genetic tilapia lines

Improved production ← Tilapia wild spawning
‘Organic’ tilapia production problem: feed must also be ‘organic’

Protein sources:
-- soja..............mostly GMO
-- fishmeal........fisheries are not ‘organic’

Conventional feeds

‘Organic’ feeds

Prohibited
Allowed only up to 5%

14% protein ‘organic’ feed pellets
‘Organic’ tilapia production problem: feed must also be ‘organic’

‘Organic’ feeds

Protein sources:
-- ‘organic’ soja
-- fishmeal up to 5%

30% protein ‘organic’ feed pellets

$ Feed price doubles

May compromise profitability
Periphyton based ‘organic’ tilapia production trial
Tilapia *Oreochromis aureus* stocking:
3-Jul-2003
each half pond = 250 m²

<table>
<thead>
<tr>
<th>Side</th>
<th>Number</th>
<th>Biomass (kg)</th>
<th>Mean weight (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Periphyton side</td>
<td>258</td>
<td>64.660</td>
<td>250</td>
</tr>
<tr>
<td>Feed side</td>
<td>258</td>
<td>65.100</td>
<td>252</td>
</tr>
</tbody>
</table>
Tilapia weight, Geva 2003

gram

01-Jul 29-Jul 26-Aug 23-Sep 21-Oct

periphyton

feed
Tilapia harvesting:
2-Nov-2003, 122 culture days, each half pond = 250 m²

<table>
<thead>
<tr>
<th></th>
<th>periphyton side</th>
<th>feed side</th>
</tr>
</thead>
<tbody>
<tr>
<td>fish number</td>
<td>248</td>
<td>236</td>
</tr>
<tr>
<td>biomass (kg)</td>
<td>111</td>
<td>107</td>
</tr>
<tr>
<td>mean weight (g)</td>
<td>446</td>
<td>455</td>
</tr>
<tr>
<td>survival (%)</td>
<td>96</td>
<td>91</td>
</tr>
<tr>
<td>growth (g/day)</td>
<td>1.61</td>
<td>1.68</td>
</tr>
<tr>
<td>yield (kg)</td>
<td>48.6</td>
<td>48.4</td>
</tr>
<tr>
<td>wild spawn. (kg)</td>
<td>13</td>
<td>10</td>
</tr>
<tr>
<td>feed (kg)</td>
<td></td>
<td>800</td>
</tr>
<tr>
<td>manure (kg)</td>
<td>90</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions:

- tilapia actively feeds on periphyton
- periphyton-based aquaculture is appropriate to reduce costs and allow economically viable organic tilapia production
Thanks