Periphyton Based Aquaculture (PBA)

Subject Name: Industrial Fish & Fisheries
1ST YEAR/IInd Sem
Paper: CC-4
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Basic Introduction

• **Feed** is one of the most important criteria for aqua farming. In aquaculture, 60% of the production cost is incurred as feed.

• In extensive & semi intensive systems, natural food like **planktons & bottom organisms** play the most vital role in fish production.

• Aquaculture is not always a truly sustainable practice, so far the **supply of external feeds, chemicals & energy inputs** are highly concerned.
Periphyton is considered as an important food component for fishes. Periphyton grows on various substratums in aquatic environment & support fish production.

Periphyton may contribute substantially to primary productivity especially in shallow freshwater ecosystems & thus provide an important energy input to both detritus & grazing food chains of the ecosystem.
What is PERIPHYTON?

The term periphyton, 'Peri' means round & 'Phyton' means Plant. (Behning, 1924).

Periphyton is defined by Azim et. al. (2002) as:
'a complex of sessile biota attached to submerged substrata such as stones & sticks & includes algae, invertebrates, detritus & micro organisms.'

It as an assemblage of organisms like algae & minute animals growing upon the free surfaces of submerged objects of water & covering them with a slimy coating. (Young 1945, Hunt et. al. 1952)

It includes sessile algae, micro fauna & other bottom organism in combination with microbial bio-films (van Dam et. al., 2002).
Biofilm/periphyton-based fish culture offers a new direction, especially since periphyton is effectively utilized by many fish species which thrive low in the food chain (Van Dam et al., 2002).

It can bring about major advances in the development of low cost farming in aquaculture with no additional feed & reduction of pollutants.
Periphyton has significant role of providing food for fish & other fauna in natural & controlled environment.

- **Who eats**: wide range of fish & benthic invertebrates including snails, chironomids, mayflies, oligochaetes & several groups of crustaceans.
The recorded protein level of 19.27-35.56% has been found in periphyton grown on bamboo substrate. (Abwao et al., 2014)
How this idea has came from???

The idea was originally derived from various traditional fishing methods...

Different Types Of Substrates Uses In PBA:

In aquaculture, the substrate can be anything ranging from coral reefs, stones, branches of any tree or higher aquatic plants, bamboo, plastic, etc.
### Some traditional substrate based fisheries

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<tbody>
<tr>
<td>ACADJAS</td>
<td>West Africa</td>
<td>tree branches</td>
<td>➢ a group of installations of dense masses of branches that are artificially planted in the muddy bottom in shallow coastal lagoons.</td>
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<td></td>
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<td>➢ Dense clusters of branches are placed in lagoons to attract fish.</td>
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<td>➢ The tree branches are known to promote the growth of periphyton, which is an excellent food for many different species of fish.</td>
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<td>➢ In addition, tree branches also provide shelter for the fish.</td>
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<td>Athkatu</td>
<td>Sri Lanka</td>
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<td>in the shallow coastal waters with more than 3000 brush parks established during the season to attract fish &amp; shrimp</td>
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<tr>
<td>Xeng</td>
<td>Assam, North eastern India</td>
<td>Bamboo</td>
<td>✓ Bamboo branches, locally known as xeng are used as natural substrate in fish culture ponds in Assam.</td>
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<td></td>
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<td>✓ Primarily done to protect fish ponds from unauthorized fishing.</td>
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<td>Samarahs</td>
<td>Cambodia</td>
<td>tree branches &amp;</td>
<td>➢ The tree branches are submersed in rivers &amp; the surface is covered with floating aquatic vegetation.</td>
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<td>bamboo shoots</td>
<td>➢ Fish begin to inhabit these structures after about two months.</td>
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<td>floating aquatic</td>
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<td></td>
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<td>weeds like Eichornia crassipes</td>
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<td>Katha</td>
<td>Bangladesh</td>
<td><em>Colocasia esculenta</em> &amp; branches of bamboo (Kanchi), mango etc</td>
<td>katha can increase biological production in three ways by&lt;br&gt;i) creating more secure &amp; diverse spawning habitats;&lt;br&gt;ii) creating more secure nursery habitats by lowering predation rates &amp; increasing survival;&lt;br&gt;iii) creating large food resources.</td>
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<td>Phum</td>
<td>Manipur (Lok Tak Lake)</td>
<td>constructed by trimming the fronds of weed mats to a width of 1-2 meters &amp; these trimmed fronds are bent in a circular format to give a diameter of 10 to 30 meters</td>
<td>Floating islands formed through the dense growth of aquatic weeds &amp; grasses are spread throughout the lake &amp; are used as the natural fish aggregating devices.</td>
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Advantages

- Reduces poaching
- Improves water quality
- Biodegradable substrates can be used as substrates
- Improves the health of culture stock
- Cost effective
- Makes farming sustainable
- Simple technology & Less input required
References:

Periphyton Growth On Natural Substrates And Its Efficacy In Aquaculture
Manas Pratim Dutta\textsuperscript{1}, Kamaleshwar Kalita\textsuperscript{2}, Bipul Phukan\textsuperscript{3}, Sangipran Baishya\textsuperscript{4} and Ranjit Bordoloi\textsuperscript{5}

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Review Paper

Potentiality of Periphyton-based Aquaculture Technology in Rice-fish Environment
S. K. Saikia\textsuperscript{1} and D. N. Das\textsuperscript{2}

Periphyton Growth on Three Bio-substrates and Its Influence on the Performance of Jaraqui (Semaprochilodus insignis)
Keshavanath P.\textsuperscript{1}, Leao da Fonseca F.A.\textsuperscript{2}, Affonso E.G.\textsuperscript{1}, Nobre A.D.\textsuperscript{1}, Jeffson N.P.\textsuperscript{1}
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