Depuration of Mussels

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Introduction:

Bivalve farming, especially that of mussels and edible oysters, is becoming popular among mariculture entrepreneurs in Kerala as the shallow waters near the coast or estuaries provide good environmental conditions for bivalve growth. Unfortunately these coastal waters are also the areas often subjected to pollution from different sources. Bivalves being filter feeders can accumulate human pathogenic bacteria and viruses when grown in polluted waters.

The main drawback to increased production is lack of an appropriate price structure and assured market for the produce. The product is exportable if it meets basic quality and sanitation standards. Through export to western markets the farmers can get better price for their produce, thereby, increasing their profit margins. However, European Union markets are very stringent about the quality of bivalve products that they import from Asian markets. To ascertain and maintain the quality of bivalve products depuration is essential.

What is Depuration?

Bivalves are filter feeders in their feeding habit. During this process they accumulate all suspended biological materials including harmful microorganisms. Before the product reaches the market, these materials have to be removed from their gut. The process of such purification is called depuration.

Hence, depuration is the process of purification of shellfish in which the animals are placed in disinfected recirculating or running seawater and allowed to actively filter feed. The process leads to elimination of bacteria from the bivalve. Disinfections of circulating seawater can be achieved by use of UV radiation, ozone treatment, irradiation etc.

Simple depuration can be achieved by starving the bivalves in clean and filtered seawater/ brackish water for a certain period of time. More effective depuration can be achieved by using disinfected water in the depuration process.

Even a simple and small depuration unit will be beyond the capabilities of the small-scale farmers, and hence, it is proposed to have depuration plants where bivalve farmers are concentrated, thus enabling the farmers to use it as a common facility for a price to be determined later.

DEPURATION PROCESS

1. Requirements:

(a) The basic principle for controlled purification or depuration of bivalve involves providing clean and purified seawater in tanks, whereby the bivalve filter and pump such water for a period of 24 hours or more if required.

(b) Ideally a depuration plant should be located near the least polluted source of water in the vicinity of bivalve farms. Also the physical characteristics (salinity, temperature, dissolved oxygen etc.) of the seawater used in the depuration plant should not be radically different from that of the bivalve farming areas. Care should be taken such that the level of dissolved oxygen should not be allowed to drop below 2 mg/l.

(c) Two concrete seawater storage tanks of the dimension 20 x 8 x 8 m (total capacity 160 tonnes) should be constructed at a level above that of the depuration tank to facilitate gravity flow into the depuration tank (see figure). The water to be used will be first pumped into a rapid sand filter (preferably 2, arranged serially) to remove all suspended material.

(d) The choices for disinfection of seawater are chlorination, ozonation and UV light irradiation. The latter two are expensive, and hence chlorination (@ 3 ppm) is the method chosen for this project. After chlorinating for 12 h, the water will be dechlorinated using vigorous aeration and / or neutralization with Sodium thiosulphate for 12 h.

(e) Most depuration plants use flow through, once through or fill and draw principles. It is proposed here to use the batch process (fill and draw), wherein seawater is drawn from the supply treated with predetermined amount of disinfectant to reduce bacterial levels, stored for a time, then pumped to the tank containing bivalves. The process will be repeated once to ensure complete depuration (see flow chart).

(f) Each depuration unit will consist of one concrete tanks of the size 15 x 4 x 1 m with a gradient of 3% to hold bivalves. Bivalves will be placed in perforated plastic trays of standard size. The trays in a single tier will be raised from the tank bottom with the help of PVC pipe runners. The tank will have drain plugs at the lower end to facilitate cleaning and flushing.

2. Run Duration and Capacity:

(a) The duration of the run will be 24 h, in two cycles with one complete flushing for both mussels and oysters (see flow chart). The unit will have the capacity to hold 1.0 tonnes of mussels and 0.62 tonnes of oysters per run. The water requirement per run will be 144 m^3.

Depuration Protocol