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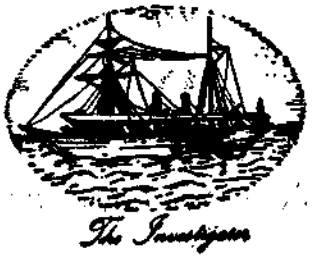

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PURIFICATION OF FARM GROWN OYSTERS

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ABSTRACT

The purification of farm grown oysters by scientific methods is essential before they are marketed. Oyster farming is a new venture in India and the technique has recently been perfected by the Central Marine Fisheries Research Institute. The most important task is to perfect the depuration process for which there is no standard method. The present paper gives a satisfactory plan for small scale purification of harvested oysters before they are marketed for safe human consumption.

INTRODUCTION

OYSTERS, mussels and clams are filter feeders and they accumulate pathogenic bacteria such as *Salmonella* spp., *Straphylococcus* spp. and *Clostridium* spp. (FAO and WHO, 1974). Under certain conditions they accumulate biotoxins, pesticides and also heavy metals (Wood, 1972). The only viral disease transmitted appears to be infectious ' viral hepatitis ' (Mason and Mc Lean, 1962). Hence purity of these shellfishes is vital before they are marketed. The awareness that the shellfishes could be purified and thus rendered harmless, goes back in history much farther than the medieval times. The Romans during the first century B.C. consumed cockles and oysters after treating them in tanks which are the earliest known examples of ' Cockle washery ' (Yonge, 1962).

Commercial producers of shellfish in many countries practise purification methods, though this differs from country to country. There are diverse methods of purification, from simple washing in chlorinated waters to exposure to ultra-violet treatment and ozonisation.

Cleaning of bacteria-contaminated oysters using their own physiological filtration mechanism was developed at the Fisheries Experimental Station, Conway, U.K. (Dodgson, 1928). Wells (1923) described a purification plant in New York, U.S.A. using chlorinated sea water. This method of chlorine sterilisation is still in vogue in many of the developed countries. Recently this process of purification has been somewhat superceded by ultraviolet sterilisation (Quayle, 1969) and ozonisation. Using sophisticated ultraviolet sterilisers reduction in coliforms, as high as 99.9% could be attained (Wood, 1961 ; Kelly, 1961).

This paper presents a plan that has been evolved for the purification of oysters farmed at Tuticorin by the Research Centre of the Central Marine Fisheries Research Institute. The water of Gulf of Mannar, particularly that in the Tuticorin Bay where the farming is centered, is to a considerable extent free from sewage and industrial pollution. But to avoid the potential rise of infection which may discourage the consumption of oysters, a depuration system has been set up. Presently about

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4800 oysters *i.e.*, nearly 600 kg can be purified per day.

Source and Quality of the Water

Sea-water required for the tanks is drawn from the Tuticorin Bay and is moderately turbid. The annual mean temperature variation of the water is 25.4°C to 30.4°C ; salinity from 31.7‰ to 37.48‰ dissolved oxygen content from 3.18 ml/l to 5.04 ml/l and pH varies from 7.68 to 8.43. The proximate bacterial count of seawater is 200-300 MPNS/ml and the coliform bacteria count 50-100/100 ml (Velankar, 1955). As the seawater required for the plant should be essentially free from turbidity, successive units for sedimentation and sand filtration have been designed for the water system to reduce turbidity which reduces the bacterial count also to a certain extent.

Water Treatment

Seawater is drawn from a distance of 80 m away from shore to an underground sump through a P.V.C. pipe line of 10 cm diameter. The pipeline has been laid at a gradient of 60 cm and water flows into the sump at the rate of 130 litres per minute. At the lowest tide the sump maintains 1,425 litres of water and during high tide the sump collects 2,500 litres of water.

Sedimentation and Filtration

From the sump the water is pumped to the sedimentation tank which consists of 4 chambers, each measuring 1.0 × 1.5 × 1.2 m. The water passes through these chambers before reaching the filter bed and turbidity of the water is very much reduced by this process.

All suspended particles in the water are effectively removed by the sand filters in the filtration tank (1.8 × 1.8 × 1.2 m). The filtered water is collected in a ground level storage tank measuring 3 m × 3 m × 1.2 m with a capacity to hold 10,000 litres of water. By employing a rotary pump driven by a 1 H.P. motor, the storage tank can be filled in an hour. All these tanks are constructed with brick and cement mortar (Fig. 1).

Oyster Cleaning Tanks

Three concrete oyster cleaning tanks each measuring 2.5 × 2.5 × 1.0 m have been constructed. For each tank separate channels of supply and drainage have been provided. The drain valve in each tank is provided in a corner fitted with a galvanised iron 'T'. The vertical limb of the 'T' is raised at a height of 50 cm so that the same height of water column can be maintained inside the tank (Pl. I A). The horizontal limb is plugged when the tank is engaged in cleaning operation. This plug is removed while draining the tank. Operated by a rotary two stage pump the water supply is effected from the top of each tank through a P.V.C. tube with jet arrangements. An independent tap is fixed to the pump with control valve for the operation of a hose.

Operation of Cleaning Tanks

Four wooden grids of the size 42 × 120 cm with a height of 15 cm are placed on the floor of one of these tanks. Oysters are arranged 2 deep on 26 nylon knitted trays each measuring 60 × 60 × 15 cm and placed on the wooden grids (Pl. I C). The oysters are thoroughly hosed by a strong jet of water to remove external mud and dirt (Pl. I B) which are sent out through the outlet. The oysters are then inspected and the damaged and broken ones are removed. By this time the second tank is made ready for cleaning the oysters. Filtered seawater is filled in the tank for cleaning the oysters. The filtered seawater is filled in the tank to a height of 50 cm and the trays with oysters numbering 2,400 are transferred into it.

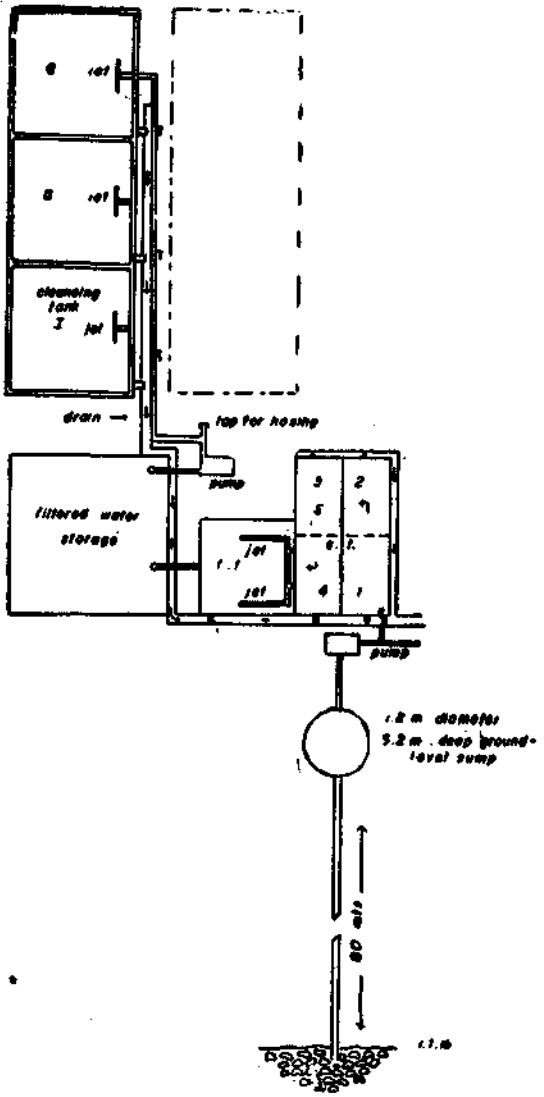

FIG. 1. Layout for purification tanks for edible oyster (f.t.—filtration tank, m.l.t.m. — maximum low tide mark and s.t.—sedimentation tank).

Through small holes a slow flow of water is maintained. The drain valve is adjusted to maintain a water column of 50 cm inside the tank. The oysters are allowed to remain for 12 hrs in this medium to rid them of bacteria by natural physiological process.

Later water in the tank is drained and the oysters are once again hosed by a strong jet of water. By this flushing the accumulated faeces and pseudo-faeces are removed from the tank and also the faeces that might have lodged between the oysters are eliminated. This reduces the chance of oysters repolluting one another. The tank is again filled with water and the oysters are immersed in it for another 12 hrs. At the end of this cleaning period the oysters are kept for one hour in freshly chlorinated seawater with 3 ppm chlorine. Immediately after this the oysters are dechlorinated by hosing filtered seawater and placing them in the holding tank. The object of dechlorination is to allow the oysters to function normally before sale and to remove the smell of chlorine. Although the chlorination method of depuration of shellfishes is followed at present, it is intended to use a suitable ultraviolet steriliser to achieve maximum hygienic standard.

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