X

MICROBIAL FLORA OF MUSSELS IN THE NATURAL BEDS AND FARMS

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Quantitative estimation of the bacterial load of the brown mussels cultured at Vizhinjam has been shown as 10^4. The occurrence of Coliforms, *Escherichia coli*, faecal streptococci and coagulate positive staphylococci is reported. *Pseudomonas*, *Vibrio* and *Micrococcus* are seen as normal flora.

INTRODUCTION

In India quite encouraging results have been achieved, in culture of the economically important species of brown mussel (*Perna indica*) and green mussel (*P. viridis*). However, adequate care has to be taken against diseases, that can occur to these animals, as they can deplete the stock as a result of mass mortality. Moreover, infestation can result in poor growth, thin meat, change of normal colour and failure of byssal development (Sindermann, 1970 in *Principle diseases of Marine Fish. and Shell-fish*, Acad., Press, 369 pp[1].). Paralytic shelfish poisoning is another problem (Mason, 1971, *Underwater Journal*, 3 : 52-59[2]). Hence, studies on the life history of the aetiological agents of various diseases, treatment of diseases and necessary prophylactic measures against diseases are significant areas for

investigations for the success and development of mussel culture.

Material and Methods

In view of the above, a preliminary study of microbial flora of suspended cultured mussels (*P. indica*) in Vizhinjam, Trivandrum and surface sea water in that environment was made. Similar investigations were carried out in the mussels of the natural beds also at Kovalam, Trivandrum for comparison.

The mussels were aseptically collected in sterile containers. Surface sea water samples were collected aseptically in sterile glass bottles both from the culture site and from the environment of the natural mussel beds. The collected samples were immediately transported to the laboratory for further investigation. In the laboratory, the mussels were aseptically opened and the mussel meat along with fluid was separated and suitably diluted in sterile sea water. Similarly, water samples were also diluted. The diluted samples were inoculated into sea water agar. The samples were further plated in selective media for coliforms, *Escherichia coli*, faecal streptococci and coagulase positive staphylococci. The inoculated petri dishes were incubated at room temperature for 2-3 days and readings taken. The selected colonies, from the sea water agar, were transferred into see water agar slants for further observation.

The isolates, were tested for their purity, and identified using the system of classification of Buchanan and Gibbons (1974, *Bergey's Mannual of Determinate Bacteriology*, 8th ed. Williams & Wilkins Co., Baltimore ; 1246 pp[8].)

Results

The results of the quantitative and qualitative studies are presented in Table 1 and 2 respectively.

Table 1. *Quantitative Aspects of the Bacterial Flora in Mussels and in Sea-water*

Organisms		Meat emulsion of the cultivated mussels	Meat emulsion of the mussels from the natural bed	Sea water from the culture site	Sea water from the natural mussel bed area
		Average counts per millilitre			
Total bacterial counts :	Oct. 1977 ..	2.5×10^6	2.2×10^5	1.7×10^6	2.0×10^5
	May 1979 ..	3.4×10^6	TNC	1.2×10^6	TNC
Coliforms :	Oct. 1977 ..	1.0×10^4	1.6×10^3	3.5×10^4	2.8×10^4
	May 1979 ..	2.2×10^4	TNC	6.3×10^4	TNC
Escherichia coli :	Oct. 1977 ..	3.0×10^3	1.0×10^3	1.4×10^3	7.0×10^3
	May 1979 ..	7.0×10^3	TNC	1.9×10^3	TNC
Faecal streptococci :	Oct. 1977 ..	Nil	Nil	Nil	Nil
	May 1979 ..	1.0×10^3	TNC	2.7×10^3	TNC
Coagulase positive staphylococci :	Oct. 1977 ..	6.1×10^3	1.5×10^3	2.8×10^3	1.2×10^6
	May 1979 ..	Nil	TNC	Nil	TNC

Nil — No growth. TNC — Test not made

Table 2. *Qualitative Aspects of the Bacterial Flora in Mussels and in Sea water*
(In percentage)

Material		*Pseudomonas* Spp.	*Vibrio* Spp.	*Micrococcus* Spp.
Meat emulsion of the cultivated mussels :	Oct. 1977 ..	50	34	16
	May 1979 ..	60	40	—
Meat emulsion of the mussels from the natural bed :	Oct. 1977 ..	50	25	25
Sea water from the culture site :	Oct. 1977 ..	50	25	25
	May 1979 ..	50	33	17
Sea water from the natural bed :	Oct. 1977 ..	37.5	37.5	25

Quantitatively, the bacterial load of the suspended culture of mussels was relatively higher than that of the mussels in the natural bed. It was 10^6 and 10^5 respectively. Similar situation was also noticed in the case of sea water. The occurrence of coliforms, *Escherichia coli*, faecal streptococci and coagulase positive staphylococci were almost steady both in mussels and sea water. Faecal streptococci was not noticed in October 1977 but noted in May 1979. Coagulase positive staphylococci which was present in October 1977 was absent in May 1979.

As the normal flora in mussels and in sea water, species of *Pseudomonas*, *Vibrio* and *Micrococcus* were present. Species of *Pseudomonas* predominated both in the mussel and sea water. All the isolates of *Vibrio* were luminescent. The results of this investigation are almost in agreement with those of Colwell and Liston (1962, *J. Insect. Pathol.*, 4 : 23-33[4]) and Karthiayani and Iyer (1975, *J. mar. biol. Ass. India*, 17(1) : 96-100[5]).

Discussion

In the present investigation, species of *Pseudomonas*, *Vibrio* and *Micrococcus* are found as the normal flora of the mussels. Aquatic bacteria such as *Pseudomonas*, *Aeromonas* and *Vibrio* are potential pathogens and can cause diseases to the aquatic animals especially when the animals are under stress (Bullock, 1964, *Dev. Indust. Microbiol.*, 5 : 101-108[6]).

In the present study, *Escherichia coli*, an indicator organism of faecal pollution, was present in the mussels and sea water both at Kovalam and Vizhinjam. This reveals the possibilities of outbreaks of epidemics like gastro-enteritis if the polluted mussels are consumed without proper washing and cooking. If these mussels are to be marketed alive, they may first be depurated as discussed by Wood (1969, *Lab. leaflet*, 20 (N.S.), Lowestaft Fisheries Lab., 15 pp[7].) and Mason (1971 and 1976, in *Marine mussels : their ecology and physiology*, Camb. Univ. Press : 585-410[8]) by storing the mussels in sterile sea water for 2 days. The depurated mussels should be well washed and cooked for human consumption.

Disease causing bacteria, fungi, viruses, protistans and other parasites have been better studied in the case of oysters and clams than in mussels. Apart from the large-scale mortality of mussels caused by the parasitic attack of *Mytilicola intestinalis* in American and European waters, pathogens like *Labyrinthomyxa marina*, *Monilia* sp., *Ostracobiabe implexa* and *Sirolpidium zoophthorum* are known to cause mortality among shellfishes. It is quite possible that under certain conditions mussels in the farm might also be affected by the above organisms. A haplosporidian, *Chytridiopsis mytilorum* is known to destroy mussel eggs in North Atlantic waters. Similarly *Haplosporidium tumefacientis* invades the digestive glands of mussels causing mild mortality. The gregarine *Nematopsis schneideri* causes mortality of mussels destroying the gill region. In Baltic waters, *Hypocomides mytili* and *Kidderia mytili* have been identified to cause mortality of mussels. *Ancistrocoma pelseneeri*, a ciliate, also causes considerable damage to the digestive system of mussels resulting in mortality. Species of *Aeromonas* and *Vibrio* are particularly dangerous to the hatchery produced molluscan larvae.

The above instances only go to show the potential dangers to be foreseen from different sources. Fortunately cases of diseases and mortality among mussels in India have not been so far reported. It is possible that this is not because of the absence of the diseases but due to inadequacy of attention to this aspect. Future investigations might throw light on this aspect.

Taking steps to prevent the outbreak of diseases is very important. In this context, the following points appear to warrant our attention.

(1) Selection of farm site free of biological and chemical contamination after studying the extent of contamination.

(2) Selection of disease resistant seed for culture.

(3) Avoiding overcrowded stocking in order to minimise the ill effects of epizootics.

(4) Care in handling the cultured stock to avoid contamination.

(5) Periodical investigation of the level of pathogenic organisms in the culture system to assess the status of the stock population.

(6) Eliminating other source of disease transmission by selective removal of reservoir host of pathogens.

(7) Routine disinfection of materials used in culture (materials like buckets, rope etc.) and

(8) Timely harvesting of stock reducing the vulnerability of older stock to diseases.