Asian J. Exp. Sci., Vol. 20, No. 2, 2006, 363-368

Distribution and Survival of Aeromonads in Fresh Water System at Jabalpur, in Relation to Faecal Pollution Bacteria

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Abstract : The river Narmada, one of the important fresh water source in Jabalpur, is used for recreational and drinking purpose by the local people in the city. The water quality is being reducing day by day due to heavy input of sewage and wastes from industrial effluents, cattle stock breeding, irrigation and human activities etc. Therefore, an attempt has been made to assess the quality of water in relation to know the pollution load. Aeromonads casual organism of acute gastroenteritis, diarrhoea and cutaneous infections has been enumerated during the present investigation period alongwith other bacteriological parameters.

Through out the study period density of Aeromonads showed possible correlation with the density of Heterotrophic bacteria but not with the density of total coliforms and faecal coliforms, which indicates that the growth of Aeromonads is affected by the presence of organic matter dissolved in water which is of non- faecal origin.

Key words : Aeromonads, FC, FS, HPC, TC.

Introduction :

Aeromonads, which have been recognized as an opportunistic pathogen causing gastroenteritis, diarrhoea, and cellulitis in man and animals, have created a serious potential threat to the public health, (Sharma and Rajput, 1995). While performing the bacteriological analysis of water for assessing its sanitary quality, it was observed that Aeromonads interfere with coliform bacteria, (Sharma and Rajput, 1996a) and give false positive results . During the present investigation it was therefore envisaged to enumerate Aeromonads along with the other bacteriological characteristics to assess the relationship between the distribution and survival of Aeromonads as faecal pollution bacteria.

Description of study sites :

Four different sites of river Narmada were selected - (i) Tilwaraghat, situated 25km. downstream to Bargi reservior and 12km. upstream to Bheraghat; (ii) Gwarighat, situated about 5km. downstream to Tilwaraghat and 7 km. upstream to Bheraghat; (iii) Jelharighat situated 1km. downstream to Gwarighat and 6km. upstream to Bheraghat and (iv) Bheraghat. 37km. downstream to Bargi reservior and 6km. upstream to Gwarighat.

Material and Methods

Different places on both the banks of river Narmada were considered as sites for regular sampling at monthly intervals during August 96 to July 97. Water samples were collected from the surface and at a depth of 30cms below the surface in sterilized glass stoppered bottles (Borosil) and brought to the laboratory in ice-cold conditions for immediate analysis, Bacteriological parameters *i.e.* Heterotrophic bacteria (H.P.C.) as CFU, Total coliforms (T.C.), Faecal coliforms (F.C.) and Faecal streptococci (F.S.) as MPN were made following standard methods (APHA, 1989).

Isolation and Quantitative estimation of Aeromonads was made following membrane filtration technique, (Rippev and Cabelii, 1979). Various biochemical characteristics of the isolates were considered for their identification according to Bergey's manual of determinative bacteriology, (Buchnan and Gibbson, 1974; Jacob and Gerstein, 1960) and PIB computer kit (Bryant, 1989).

Results and Discussion :

Heterotrophic plate count (HPC) was done in order to study the trophic state of any water system. Highest density of Heterotrophic bacteria 25.0 × 10^2 CFU/ml was recorded at Tilwaraghat and lowest 17.2 × 10^2 CFU/ml was recorded at Jelharighat in the beginning of summer. The density of Aeromonads was reported to be maximum 95 CFU/100ml at Tilwaraghat while minimum 47 CFU/100ml was reported at Jelharighat during winter (Table 1).

The density of heterotrophic bacteria and Aeromonads showed significant trend of variation with detectable seasonal pattern. The densities of these bacteria were maximum during rains due to extensive run off from the catchment areas, soil run off and increased human activities. In rest of the period the growth may be influenced due to optimum temperature.

The correlation between H.P.C. and Aeromonads indicates that both are autochthonous inhabitants of fresh water and are indigenous to these ecosystems, (Sharma and Rajput, 1996 b). It has also been suggested that these group of bacteria are the suitable index for the assessment of trophic state in any fresh water body, (Rippey and Cabelli, 1980).

The maximum density of total coliforms >1600 MPN/100 ml was recorded at Tilwaraghat and minimum 218 MPN/100 ml was recorded at Jelharighat (Fig. l a).

The density of faecal coliforms was highest >1600 MPN/100 ml at Tilwaraghat throughout the study period and lowest 155 MPN/100 ml at Jelharighat (Fig. l b).

Maximum counts of faecal streptococci >1600 MPN/l00ml was reported at Tilwaraghat and minimum 90 MPN /100 ml was reported at Gwarighat (Fig. l c).

Through out the investigation period the density of TC, FC and FS showed insignificant variation and in accordance to organic and faecal pollution load received, from the urbanized catchment areas at all the sites, which also indicates that the river although is organically polluted to some extent but the pollution due to faecal contamination is more.

Although the density of Aeromonads agrees with organic and faecal pollution, no distinct correlation between the two was observed (Fig. l d). It has been observed that there is an association between the density of Aeromonads and total coliforms at sites where faecal pollution is high which indicates that Aeromonads have dynamics similiar to those of the coliforms. The data also reflects that at most of the sites the density of Aeromonads is supported by the density of faecal pollution indicator bacteria. The absence of correlation between the faecal coliforms and Aeromonads can be explained by the multiplication of Aeromonads in these habitats as a result of the presence of an external source of nutrients of non-faecal origin. It is more likely that Aeromonads

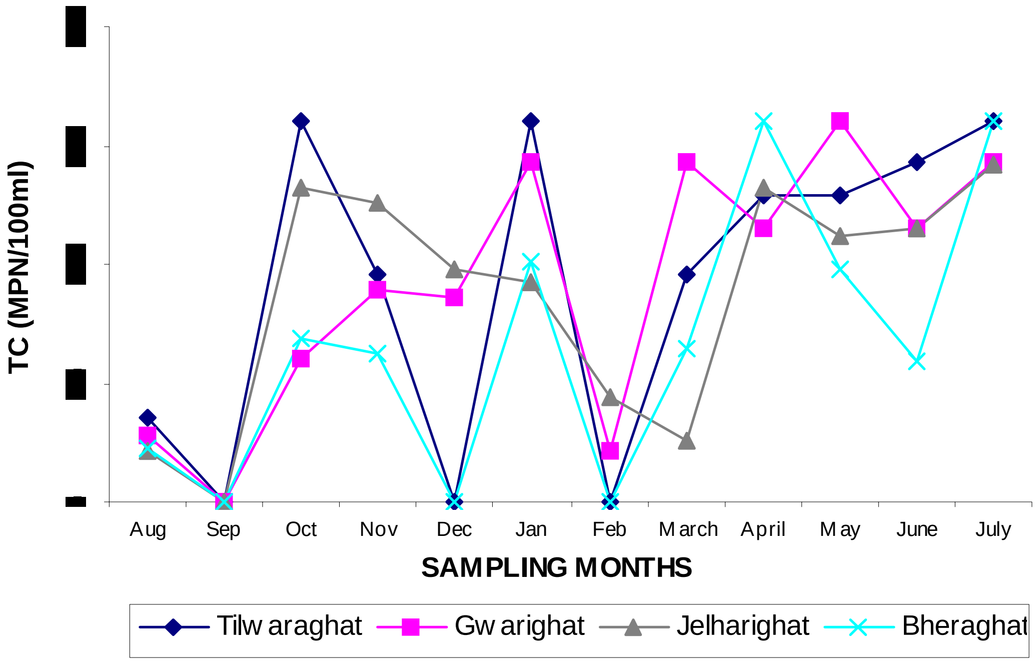
TC (MPN/100ml)
Aug
Sep
Oct
Nov
Dec
Jan
Feb
March
April
May
June
July
SAMPLING MONTHS
Tilwaraghat
Gwarighat
Jelharighat
Bheraghat

Fig. 1- (a)

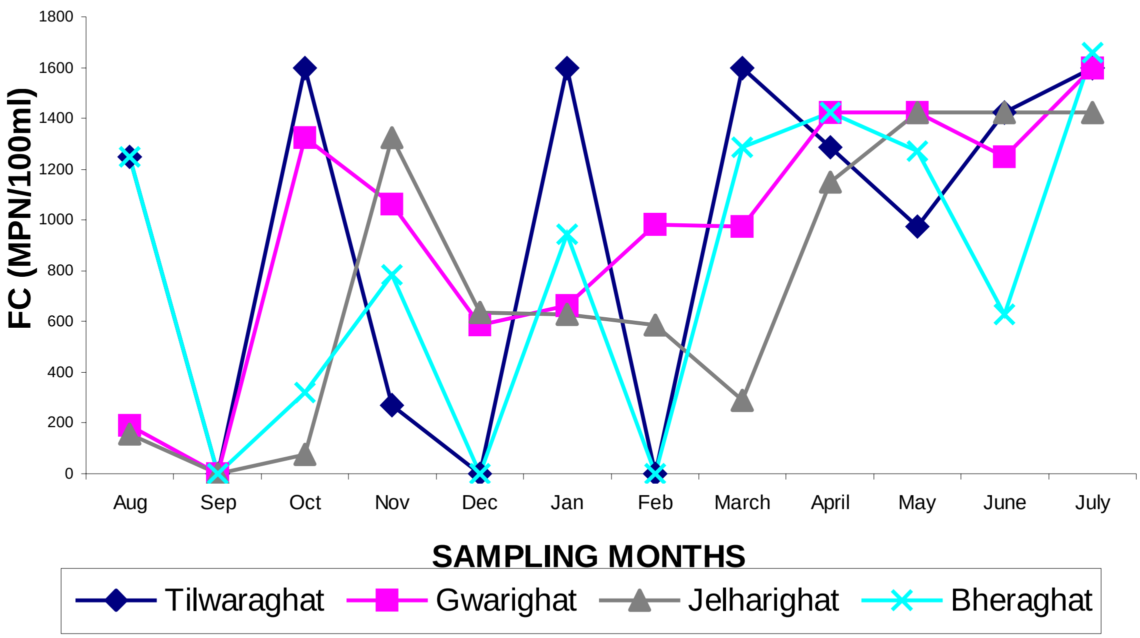
FC (MPN/100ml)
0
200
400
600
800
1000
1200
1400
1600
1800
Aug
Sep
Oct
Nov
Dec
Jan
Feb
March
April
May
June
July
SAMPLING MONTHS
Tilwaraghat
Gwarighat
Jelharighat
Bheraghat

Fig. 1- (b)

Fig. 1- (c)

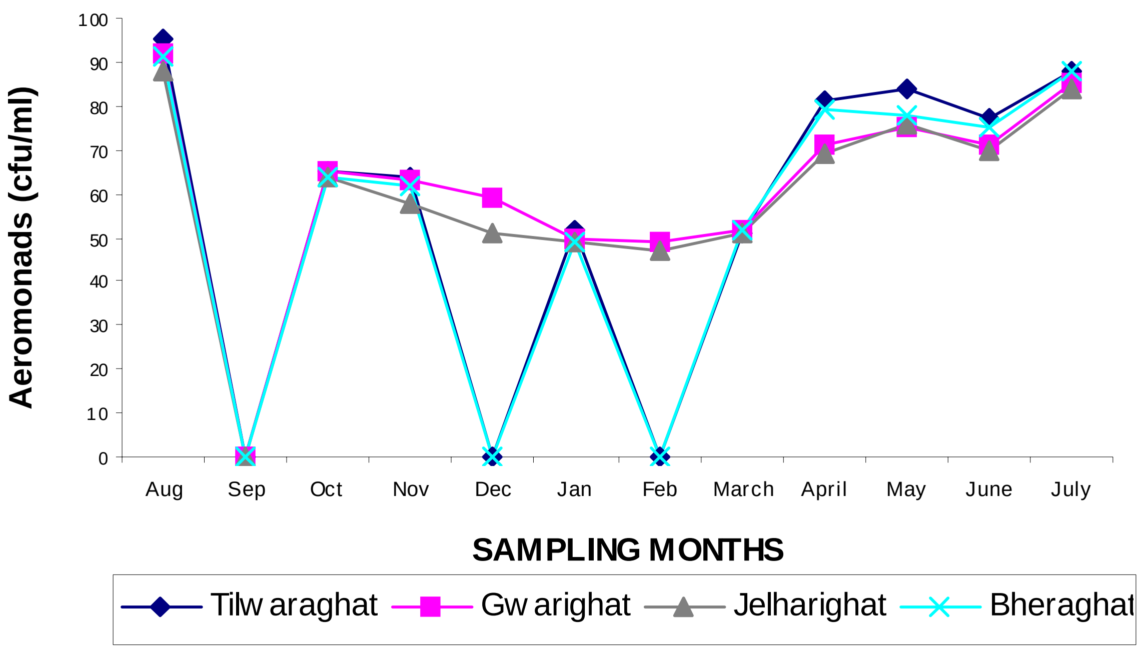

Fig. 1- (d)

Fig. 1- Distribution of (a) Total Coliforms (b) Faecal Coliforms (c) Faecal Streptococci & (d) Aeromonads at various sites of river Narmada at Jabalpur (Augest 96 to July 97).

Table 1 : Heterotrophic plate count and Aeromonads at different sites of river Narmada at Jabalpur from August 96 to July 97 (Mean values).

Sampling Month	Organism	Tilwaraghat	Gwarighat	Jelharighat	Bheraghat
Aug 96	a	24.3	24.2	22.5	23.9
	b	95.0	92.0	88.0	91.0
Sep	a	ND	ND	ND	ND
	b	”	”	”	”
Oct	a	21.5	20.1	19.5	20.2
	b	65.0	65.0	64.0	64.0
Nov	a	21.0	19.6	18.4	20.3
	b	64.0	63.0	58.0	62.0
Dec	a	ND	19.8	19.1	ND
	b	”	59.0	51.0	”
Jan 97	a	20.5	18.6	17.3	20.0
	b	52.0	50.0	49.0	49.0
Feb	a	ND	17.6	17.2	ND
	b	”	49.0	47.0	”
March	a	19.2	18.7	18.3	18.3
	b	51.0	52.0	51.0	52.0
April	a	20.8	20.4	20.1	20.4
	b	81.0	71.0	69.0	79.0
May	a	21.6	21.4	21.7	22.5
	b	84.0	75.0	76.0	78.0
June	a	22.3	20.5	19.1	21.1
	b	77.0	71.0	70.0	75.0
July	a	25.0	24.2	23.7	23.9
	b	88.0	85.0	84.0	88.0

a. Heterotrophic plate count cfu/ml × 10^2. b. Aeromonads cfu/100ml.

can multiply in natural aquatic habitats, (Rippev and Cabelli, 1985) and whose growth is aided by the presence of organic matter. The same effect was shown in tap water, (Rippev and Cabelli, 1985) and in the river water, (Rosa *et al*., 1989) where these micro-organisms can grow with the addition of very small quantities of organic substrates.

In conclusion, Aeromonads have a close relationship with indicator organisms of faecal pollution in habitats where the organic matter is of faecal origin, but not in those habitats where organic matter is of a different origin. So the exclusive use of the faecal bacteria indicators underestimate the risk of infection posed by opportunistic pathogens like *Aeromonas* spp. and we consider it advisable to monitor these bacteria especially in drinking and recreational water where the risk of direct infection to humans is high as well as in aquiculture, (Rosa *et al*., 1989).

Acknowledgements :

The authors are thankful to Prof, R.C. Rajak, Head, Deptt. of Bioscience, R.D.University, Jabalpur, for providing laboratory facilities and to MPCST for their financial assistance.

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