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Total and faecal coliforms bacterial status of Mahi Bajaj Sagar Banswara, Rajasthan

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Abstract
The present investigation was done in February to April 2018 dealt with the microbiological parameters of Mahi Bajaj Sagar Dam, Banswara. The Mahi Bajaj Sagar lies in village Borekhera about 16 Kms. North East of Banswara town and is one of the biggest artificial dam in South Rajasthan having the catchment area of 6149.00 sq. Kms. The water quality of Mahi Bajaj Sagar is low polluted. The bacterial load of the reservoir is very low and the values of bacterial load show its low pollution status. The results of bacteriological study exhibited an average high total coliform count at stations B and low coliform count at E. The faecal coliform high at station B and lowest at station E.

Keywords: Water quality, total coliforms, faecal coliforms

1. Introduction
Rajasthan is India's largest state by area (132,139 sq. mile) or 10.4% of India's total area). It is situated on the North Western side of India. Total water resources available for fisheries in the State are 15838 no. of water bodies covering an area of 4,23,765 hectare excluding rivers and canals (30,000 ha.) and waterlogged area (80,000 ha.) at Full Tank Level (FTL). In addition to it, 1,80,000 hectare salt affected area is also available. The present study was carried out during February to April 2018 in Mahi Bajaj Sagar Dam. Banswara found the total number of water bodies is 441. The dam was constructed during 1983 across the River Mahi at borkhera village16 kilometres northeast of Banswara district. It is the largest reservoir of Rajasthan with water the spread area of 13500 ha. at full reservoir level (FRL). The Mahi Bajaj Sagar Dam is situated in Banswara district of Rajasthan (74° 32'0"E and 23° 37' 0" N). It has a storage capacity of 32.4 million cubic meters. The average of depth of visibility was 240.65cm. There is found the variety of fishes in the natural environment. Now it famous for culturing of catfishes and tilapia in cages. Water is a major source of contamination of fish in relation to the microbial hazard (Sabae *et al*. 2005) [14]. The indicator microorganisms such as total and thermo tolerant coliforms, Escherichia coli and faecal streptococci, are commonly used to assess the contamination level of water and food. The faecal streptococci and mainly, the Enterococcus is one of the most efficient indicators for faecal contamination in water (APHA, 2005) [3]. The microbiological quality of fish can be measured by using aerobic plate counts, coliform counts, faecal coliform counts and E. coli counts. Microorganisms have a very important function in water bodies since they participate in the transformation of the nutrients, the nutrition of animals and disease control. They may also affect various parameters of water quality, such as dissolved oxygen, pH and ammonia (Moriarty, 1997) [8]. The objective of the study was to investigate the number of total and faecal coliform bacteria of Mahi Bajaj Sagar.

2. Materials and Methods
2.1 Sampling Stations
Sampling for estimating bacteriological parameters was conducted at five fixed stations *viz*. A was located on the South, B was located Western, station C was located on South East, station D was located at the North East and station E was selected East of Mahi Bajaj Sagar. At each station, 6 surface water samples were randomly collected at fifteen days interval up to 3 months.

2.2 Sample Collection
During the study period, Water samples for microbial analysis were brought to the laboratory in pre-sterilized glass stoppered bottles of 250 ml capacity and these bottles were secured by wrapping brown paper round these before use. Then analyzed as soon as possible using the standard method of APHA (2005) [3] and WHO (2006) [17].

3. Results and Discussions
3.1 Bacteriological Status of Mahi Bajaj Sagar
Coliform bacteria are described and grouped, based on their common origin or characteristics such as *Escherichia coli (E. coli*), as well as other types of coliforms bacteria that are naturally found in polluted water. Coliforms organisms are used as indicators of water pollution. The presence of faecal coliform bacteria in aquatic environments indicate that the water has been contaminated with the faecal material of man or other animals. Clark and Pogel (1977) [4] considered coliforms as a reliable indicator of contamination of water. Total coliforms indicate degree of the pollution and their higher density shows the difference between clean and polluted waters (Ray and Hill, 1978) [12]. Faecal coliforms have long been used as an indicator of pollution in water (McMath *et al.* 1999) [7], due to the potential for introduction of pathogens and other pollutants along with these bacteria (Ricca and Cooney, 1999) [13]. Further, a higher coliforms count confirms various anthropogenic factors namely, the release of sewage into the water body, cattle and pet wastes etc. (Gearheart, 1999) [6]. Similar results were observed by (Potgieter 2005, Abaas *et al.* 2007, Qtaibi 2009, Addo *et al.* 2009, Singh *et al.* 2009 and Danba *et al.* 2015) [9, 1, 10, 2, 15, 5].

In the present study results showed that the Mahi Bajaj Sagar Dam is low polluted. Further, it is clear that station A and B is the main source of contamination in a dam. Tzannetis and Vassilopoulos-Kaclas (1993) [16], Rao *et al.* (1994) [11] reported that the number of total and faecal coliform bacteria is indirectly proportional to the distance of an obvious source of contamination. Thus, the bacterial population is found to be invariably lower in low nutrient or oligotrophic waters.

3.2 Total coliforms
The bacteriological status of the Mahi Bajaj Sagar under investigation in general, follows the trends shown by that of limno-chemistry. Herein, total coliforms were evident from the values which varied at all the five stations (A, B, C, D, E) 11 to ≥32, 11 to ≥28, 6.1 to ≥ 14, 4.5 to ≥ 14, 1 to ≥ 10 MPN/100ml. The average values of total coliforms were 19.5, 19.6, 10, 9.3, and 5.2 MPN/100ml at stations A, B, C, D and E respectively. Station E maintained comparatively lower values of total coliforms which varied from 1 to ≥10 MPN/100 ml (Tables 1). Station B maintained comparatively higher mean values of total coliforms 19.6 MPN/100 ml. In general, the water of five stations (A, B, C, D, E) exhibited overall mean value of total coliforms 12.76 MPN/100ml (Table 2).

3.3 Faecal coliforms
In Mahi Bajaj Sagar the faecal coliform numbers were evident from the values which varied at all the five stations (A, B, C, D, E) 9.3 to ≥26, 13 to ≥22, 7.8 to ≥ 19, 7.8 to ≥ 17, 1 to ≥ 12 MPN/100ml. The average values of faecal coliforms were 16.5, 17.6, 12.66, 13.46, and 6.86 MPN/100ml at stations A, B, C, D and E respectively (Tables 1). Station B maintained comparatively higher mean values of total coliforms 17.6 MPN/100 ml. In general, the water of stations A, B, C, D and E exhibited overall mean value of 13.43 MPN/100ml faecal coliforms (Tables 2).

Table 1: Minimum-Maximum range and mean values of Total and Faecal Coliforms in surface water of Mahi Bajaj Sagar, Banswara (Rajasthan)

S.N	Parameters	Minimum-Maximum range	Mean Value					S.D
	Stations		A	B	C	D	E	
1.	Total Coliforms (MPN/100ml)	11-32	19.50	19.66	10.06	09.36	05.26	04.67
2.	Faecal Coliforms (MPN/100ml)	1-26	16.55	17.66	12.66	13.46	06.86	03.79

Table 2: Mean values of Total and Faecal Coliforms of surface water of Mahi Bajaj Sagar, Banswara (Rajasthan)

S.N	Parameters	Mean values
1.	Total Coliforms (MPN/100ml)	12.77
2.	Faecal Coliforms (MPN/100ml)	13.44

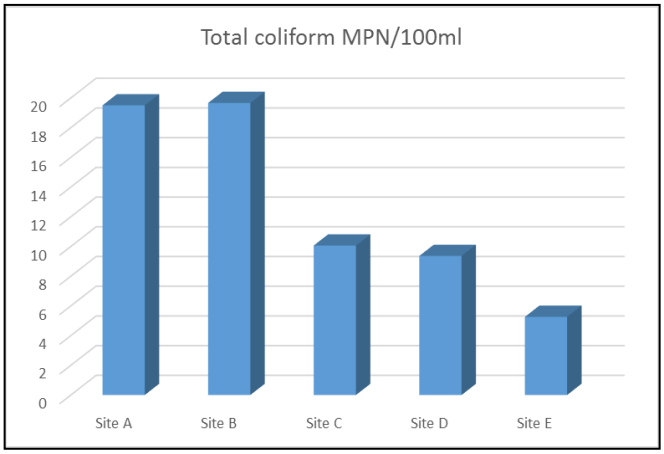

Fig 1: Average fortnightly variations of total coliform bacteria at all five stations

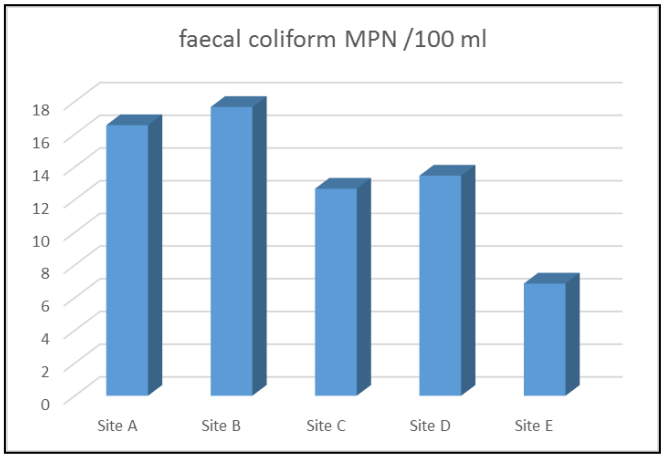

Fig 2: Average fortnightly variations of faecal coliform bacteria at all five stations

All figure X axis is denoted stations and Y axis is reading of parameters

4. Conclusions

1. This study has provided information on about that water body is relatively moderate levels of nutrients. So That these can be placed under the category of 'moderately eutrophic' water.
2. In view of all above, the bacterial load in Mahi Bajaj Sagar appears to be normal and expected for natural uncontaminated water. Obviously this indicate lack of any stable organic contamination thus, offers congenial environment to aquatic creatures and ichthyofaunal in particular.
3. The highest number of bacterial count found at human interference area of reservoir.

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