

MICROBIAL QUALITY OF WATER

Brilla Balsam J* Lancelet T.S.**

*PhD Research Scholar, Sree Sankaracharya University of Sanskrit, Kalady

** Associate Professor, Geography Department, Sree Sankaracharya University of Sanskrit, Kalady

Abstract

It is necessary to know the potability of water we drink because water quality is one of the factors that determine human health. In this study water samples from wells and surface water sources are collected for the analysis of micro-biological characteristics of water. The indicator bacteria namely coliforms can reveal the microbial character of drinking water. Escherichia coli (E.coli) is commonly used as an indicator organism for fecal contamination. Water contaminated with micro organisms can cause stomach and intestinal illness.

Key words: Microbial water quality, coliforms, human health.

Introduction

Water can be considered as the life giving factor because it supports life and wide variety of activities. Water has a great influence on human health. Water has been pure in its natural form whether it is underground or surface water except in sea. But human activities gradually lead to the decrease in quality of water.

Open wells of Kerala are under threat of bacteriological contamination. About 60% of the population in Kerala relies on ground water for drinking. At the same time, studies have shown that fecal contamination is present in many of the drinking water wells. The open character of the wells and conventional maintenance habits such as use of buckets and rope to draw water, kitchen wastes and pit latrines with average family load factor (5 members) at a distance of less than 7 meters from wells are some of the contributing factors to the bacteriological contamination

Study Area

The study area Kalady is a census town located east of the Periyar River, in the Ernakulam district of Kerala, India (Census 2011). Kalady Panchayat lies in the major watershed Periyar and form parts of sub watersheds 14P24a, 14P24b and 14P25a. The area is between 10° 09'10"N and 10° 11'50"N latitudes and 76° 21' 05" E and 76° 27' 31"E longitudes.

Rainfall is heavy in kalady due to the presence of eastern hills. Rain occurs 139 days a year. The average rate of rainfall is 343cm/year. Occasional flood during rainfall season is common in the area. So chance for bacterial contamination is also high.

Materials and Methods

Data source: Primary data regarding water quality was collected by grid sampling method and analysis was done in the laboratory. Secondary data was collected from census report, panchayat reports and literature review.

Primary Data: The water resources of kalady panchayat were divided into surface water and ground water. Surface water includes ponds, streams and Periyar River. Ground water is represented by wells. Random grid sampling method was used to take samples from ground water. Random sampling method was used to take samples from surface water. Samples were collected in three seasons namely pre-monsoon, monsoon and post-monsoon. In the case of interval of sampling, systematic sampling method was used both in surface and ground water. 12 samples from ground water, 9 samples from streams, 2

samples from ponds and 2 samples from Periyar River were taken for laboratory analysis. For analyzing micro-biological aspects namely total coliforms, fecal coliforms and fecal *streptococci* standard plate count method was used. Total 75 samples were collected in three seasons.

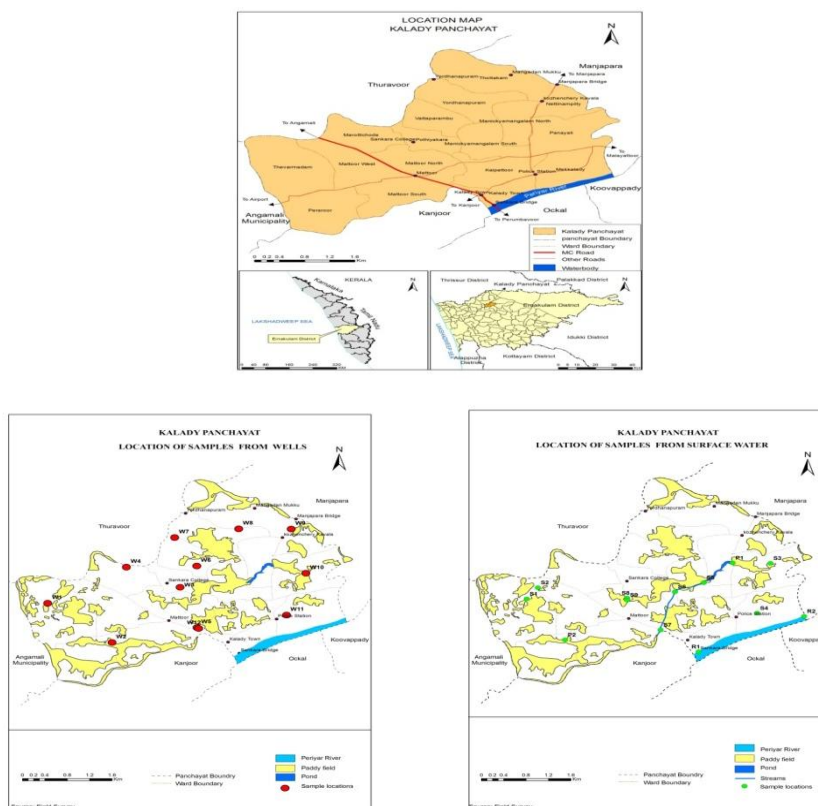


Figure 1. Location Map

Microbial Quality of Water

Coliform organisms have been used as an indicator to determine the micro biological characteristics of water. The coliform group of bacteria is aerobic and gram-negative that ferment lactose to gas within 48 hours at 35°C incubation. Coliforms are capable of growing in the presence of bile salts. The concentration of indicator organisms can be reported in CFU/100mL (CFU = colony forming units). Organisms that are considered as indicator organism for contamination of water are total coliforms, Fecal coliforms, E.coli and fecal streptococci. *Escherichia coli* (E.coli) is commonly used as an indicator organism for fecal contamination. This organism is present in the intestine of warm-blooded animals. So *E. coli* grows well at 44.5°C. The presence of *E. coli* in water samples indicates the presence of fecal matter and then the possible presence of pathogens of human origin. It may contain other harmful or disease causing organisms like bacteria, viruses and parasites. Drinking water contaminated with these organisms can cause stomach and intestinal illness including diarrhea and nausea, and even lead to death. These affect more severely and possibly life threatening for babies, children and the elderly with immune deficiencies or other illnesses.

Total Coliforms

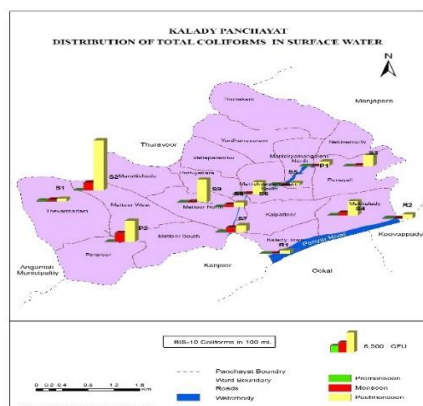
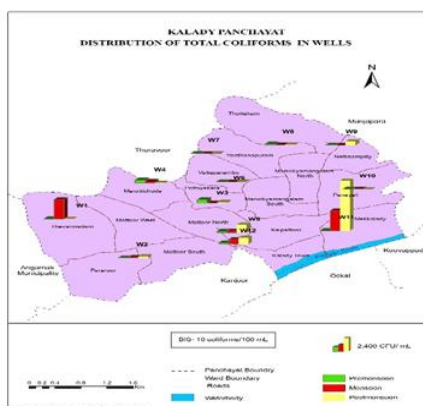
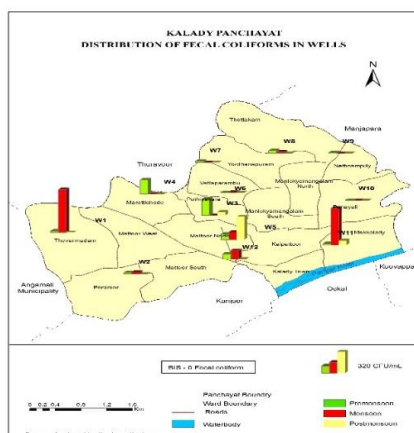
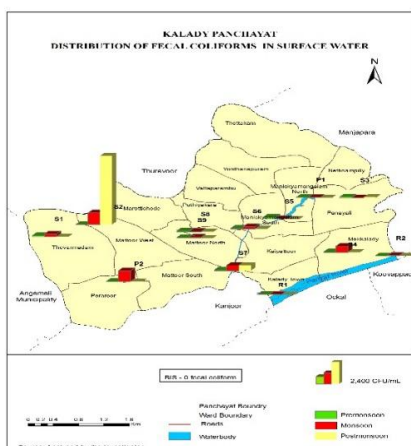
Coliforms are indicators of contamination in water. The study area shows coliform contamination both in wells and surface water. In surface water, P1 shows coliform count only in post-monsoon season. Surface water shows coliforms at an increasing rate from pre-monsoon to monsoon and from monsoon to post-monsoon. Maximum growth in wells is in W11 (4700 CFU/mL) and in surface water it is in S2 (12600CFU/mL).

Fecal Coliforms

Fecal Coliforms have no growth in most of the wells and surface water in the post-monsoon season. W10 and P1 have no fecal contamination in three seasons. The amount of fecal coliforms is high in monsoon period. In wells, the maximum count is 640 CFU/mL i.e. in W1. In surface water, S2 has the maximum count of 4800 CFU/mL.

Fecal streptococci

Fecal *streptococci* have no growth in wells named W6, W7 and W10 in three seasons. Surface water has high growth of fecal *streptococci* except in P1. The maximum count in wells is 1780 CFU/mL which is in W11. In surface water, S2 has the maximum count of 4600 CFU/mL.



Conclusion

Monsoon season shows maximum contamination level. This season has the monsoon showers and increased rate of flooding. Unscientific septic tank construction may be the main reason for fecal contamination. Ecosan toilets are suitable for the study area to overcome the problem. Water should be consumed after rolling boiling.

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