

# Term paper on water quality and contamination

[Environment](#), [Pollution](#)



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## **Abstract**

This report delineates the water quality and contamination of groundwater based on different water samples in three experiments. The water quality was monitored by adding laundry detergent, oil and vinegar in one experiment. The effectiveness of filtered water was evaluated in the second experiment by passing the contaminated water through filter layers containing sand, gravels and charcoal. The filtrate showed clear water compared to raw water. The third experiment was conducted to make a comparative analysis of water samples obtained from tap water with two types of bottled water samples. The samples obtained from Dasani and Fiji bottled showed good water quality characteristics compared to tap water. The value for total alkalinity, pH, total chlorine and total hardness was found

as 120 mg/L, 5, 0. 2mg/L, and 50mg/L respectively. Chloride content was found in tap water having value of 500mg/L. The concentration of phosphate was found as 10, 25 and 50 mg/L for tap water, Dasani and Fiji bottled water samples respectively. Overall results obtained for Dasani and Fiji bottles were in accordance with WHO guideline values and confirmed our assumed hypothesis.

## **Introduction**

Safe and clean water is one the basics' human needs. Contaminated water is unsafe for man and his environment. The use of contaminated water can cause many waterborne and water-related diseases including cholera, diarrhea, hepatitis and so forth.

The World Health Organization has issued parameters and guideline values for different contents present in drinking water. The contamination may happen due to various sources including point or non-point sources. It can be further classified into physical, chemical and biological contamination or pollution. Chemical and biological contamination is hard to remove without particular treatment process. The different salts and metals like fluoride, chloride, nitrate, iron, magnesium, arsenic and so forth have significant concerns regarding health issues. Organic compounds that contain cyclic chains including hydrocarbons are difficult to be dissolved. This is imperative to keep their concentration within safe limits according to WHO guideline values (APHA, 2005; Bashir, Salmiaton, & Bashir, 2012).

Contamination of ground water may occur due to application of many chemicals like pesticides, fertilizers, domestic and industrial waste and oil spills. This contamination cause outbreak of numerous diseases as well as

effect plants and animals (Charles, Gerba, & Rock, 2014). The mineral and chemical constituents present in tap water or bottled water are important to monitor. Many studies proved that mineral water or bottled water extracted from groundwater depends on the composition of rocks present underlying the water bearing strata. The commercial companies employ further treatment to increase the safety and taste of water. Different disinfection practices including chlorination is commonly used to kill the harmful microorganisms/pathogens. The residual level of a disinfectant is kept within the standard limit to avoid from taste and aesthetic issue (Dinelli et al., 2013; Platikanov et al., 2013).

The water should be treated, and most tradition methods are known as slow sand and rapid sand filtration methods. This involves screening, coagulation, flocculation, sedimentation, filtration and disinfection. Sedimentation can remove the course particles with prior co-angulation process. Coagulation process facilitates in making bigger flocs of the particles that may settle down in the sedimentation tank. The fine particles can be effectively removed by passing the effluent of sedimentation tank through filter bed. Sand, gravels and charcoal are commonly used material as a filter bed. The fine particles are removed due to the adsorption process during filtration steps. Disinfection is necessary to kill harmful microorganism (Sincero & Sincero, 1996).

The report seeks to evaluate water quality and contamination by conducting three experiments. At first, experiment was conducted to observe the effects of groundwater contamination. Second experiment evaluates the effectiveness of water treatment. Final experiment observes different

contents present in water samples obtained from three different sources including tap water, Dasani and Fiji bottled water. All these three experiments provide the answers of many questions regarding water quality and contamination related to safe drinking water that is essential for human health and plants.

The hypothesis for all experiments was assumed that are as follows. 1) Oil does not contaminate groundwater, and on the other hand vinegar and laundry detergents have hazardous effects. 2) Coagulation is an important step in order to remove the pollutants prior to filtration. The alkalinity of the water plays its vital role to agglomerate the fine particle that enhances efficiency of the treatment process. 3) Tap water contains a higher level of pollutants compared to bottled water. Bottled water is provided after processing under controlled and well-defined process. So, it should possess better water quality parameters compared to tap water that is supplied through piping network.

## **Materials and Methods**

### **Experiment 1**

The experiment 1 was conducted to evaluate the different contaminants present in groundwater. Eight beakers were used in this experiment with proper labelling and filled with 100ml of water. Results of sample used in beaker 1 were recorded. 10mL of vegetable oil was added to the beaker no. 2 and rinsed with a wooden stick. 10mL of vinegar was poured in beaker 3. The same quantity of detergents was added to beaker 4. The cheesecloth having four-thick layers was placed in the funnel that was filled with 10mL of soil. This funnel having soil was placed in beaker 5 and content of beaker 1

was poured to get filtrate in beaker 5. All the observations were recorded and tabulated in the Table 1. The same filtering process was repeated for the beaker 2, 3 and 4 by using a new cheesecloth followed by beaker 6, 7 and 8.

## **Experiment 2**

The experiment was carried out to evaluate and analyze the effectiveness of water treatment method. 100mL of soil was placed in a 250 ml beaker in this experiment, and 200 mL of water was added. The prepared solution was poured, and this process was repeated 15 times between the two beakers. 10mL of the contaminated water solution was poured into 100mL beaker that was used for comparative analyses with treated water sample. Alum having quantity of 10mL was added in the beaker containing contaminated water solution. The solution was passed through a bed of charcoal, sand and gravels. Few drops of bleach were added in the filtered water. The filtrate was compared against contaminated water.

## **Experiment 3**

The experiment 3 was conducted to evaluate the quality of two bottled water samples. The purpose of this procedure was to compare bottled water quality with tap water. These water samples were poured into three beakers having capacity of 250mL. These beakers were properly labeled as Dasani, Fiji and tap water. Chloride, Ammonia, pH, Alkalinity, Total hardness, Total chlorine, Phosphate and Iron contents were measured. The results were recorded in tabulated form.

## Results

The observations noted for vinegar, oil and detergent in beaker 1-8 are presented in Table 1. The concentration of ammonia was observed " 0mg/L" in all three samples as presented in Table 2. Chloride content was found in tap water having value of 500mg/L while " 0 mg/L" value was observed in both Dasani and Fiji bottled water samples. Total alkalinity, pH, Total Chlorine and Total hardness concentration was observed as 120 mg/L, 5, 0.2mg/L, 50mg/L in tap water sample respectively. While Total alkalinity and pH for both Dasani and Fiji water sample was observed 40 & 180mg/L as well as 3 &6 respectively. Total Chlorine and Total hardness were noted as zero for both the samples as presented in Table 4.

The phosphate concentration was obtained in three water samples as 10 mg/L, 25 mg/L and 50 mg/L for tap water, Dasani and Fiji water samples as presented in Table 5. Iron content was found in tap water having value of 0.10 mg/L while Dasani and Fiji bottled water showed zero concentrations as presented in Table 6.

## Discussion

Oil could be trapped in the soil, and vinegar showed ability to pass through the soil. Consequently, I accepted both the hypothesis assumed for oil and vinegar. The hypothesis assumed for laundry detergent is rejected as it contaminates the water. Coagulation process in alkaline condition removed the contaminants and so I accepted the hypothesis that the agglomeration of particles enhances effectiveness of the effectiveness of the treatment. The hypothesis assumed for experiment 3 is accepted because Dasani and Fiji water sample showed negligible contamination compared to tap water

sample.

The results obtained in the experiment 1 showed the absence of visible contaminants and oil float on the top surface due to the difference in viscosities. It is convenient to remove it from the top. The detergent particles dissolved in the water that change the colour and the developed odor. The experiment 2 provided clear water due to coagulation prior to filtration. The result obtain regarding all pollutants or contaminants were well within standard guideline values. It proved that Dasani and Fiji water quality is good for human health. This is because of their processing for water quality before supply.

Temperature, colour, and time of the day can create interference in different processes (APHA, 2005). But in my experiments, this interference can be declared as negligible as all obtained results were within limits. As per my opinion, bottled water has worth of price due to its quality standards. The water is processed and analysed against different water standards prior to supplying in bottles.

## **Conclusion**

The three experiments have reflected that groundwater may be contaminated by the man-made activities. This was evaluated by adding laundry detergent, oil and vinegar in different water samples. Similarly, water treatment is an essential process to ensure the health of human and his environment. Tap water was evaluated, and results were compared with Dasani and Fiji bottled water. The potential socio-economic issues associated to unclean water are enormous. Thus, regulations and mitigating strategies should be set to protect water.



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