ISSN (Online): 2455-7838

SJIF Impact Factor (2016): 4.144

UGC Approved Journal No: 48844

EPRA International Journal of

Research & Development

(IJRD)

Monthly Peer Reviewed & Indexed International Online Journal

Volume:2, Issue:7, July 2017

Published By : EPRA Journals

UGC Approved Journal No: 48844 ISSN: 2455-7838(Online)
EPRA International Journal of Research and Development (IJRD)
SJIF Impact Factor: 4.144 Volume: 2 | Issue: 7 | July | 2017

PHYSICO-CHEMICAL ANALYSIS OF SURFACE WATER AND GROUND WATER

Subramanya R. Sharma[1]
[1]Civil Engineering SDMIT,Ujire, Karnataka 574240, India

Jayaram Bhat[2]
[2] Mechanical Engineering SDMIT,Ujire, Karnataka 574240, India

Vishwanatha Bhat[3]
[3]Civil Engineering SDMIT,Ujire, Karnataka 574240, India

ABSTRACT

Physico-chemical analysis of water samples is carried out to find the water quality and its suitability to both drinking and other essential purposes. About 34 groundwater and surface water resource samples were used for analysis from the various agricultural farms from Endosulfan effected area. The tests mainly include for physical parameters such as turbidity and chemical parameters such as pH, acidity, chloride, hardness and fluoride. Since, use of chemical fertilizers is extensively practiced in this area, more emphasize is given to presence of nitrate, phosphate and potash. Later, the test results are analyzed and compared with drinking water standards. The ground and surface water resources of the farms, where chemical fertilizers used, are considerably affected by Nitrogen (N), Phosphorous (P) and Potash (K), however, found to be well within the permissible limits, as per Burero of Indian Standards.

KEYWORDS: *Physico-chemical analysis, groundwater and surface water, chemical analysis*

I. INTRODUCTION

One of the important substances on Earth is water. All living creature on this planet need water for their survival. Based on its clear importance water is the most studied material on earth.

According to the World Health Organization (W.H.O) - *"the quality of drinking water is a powerful environmental determinant of health".* Water quality is important since safe water is crucial for health and development. The primary sources of drinking water in rural areas are groundwater and surface water. Agriculture and related activities in rural areas include tons of Chemical Fertilizers, Cow-dung manure and bio-wastes which are applied to the farms every year, to make soil fertile and increase the crop yield. Along with these farmers apply pesticides and insecticides to protect their crop. During rainy season, heavy runoff water is expected in the farms. Chemical fertilizers though make soil fertile, at the same time, the chemicals present in them are washed away by heavy rainfall runoff, carrying them to open water sources and nearby streams and rivers, leading to contamination. A substantial amount of these chemicals may percolate and join the ground water too. In this context, a study is made to know extent of contamination of water in these agricultural farms, by making detailed analysis of physical and chemical properties of the water is presented in this paper.

There are plentiful research communications which aim towards the quantitative and qualitative analysis of ground water and surface sources. A water quality criterion of various ground waters has been studied from different sources e.g. Tube well, dug well, bore well etc. by a number of Researchers. These research works mainly concentrated in and around the North-West Asian continents. Of these, [1], [2], [3], [4], [5] deal with the quantification of water qualities. These methods involves various sampling methods and samples were analyzed for physic-chemical parameters such as pH, turbidity, EC (electrical conductivity), TDS (Total Dissolved Solids) and residual chlorine. These samples were found unsafe with respect to chlorides and seven with respect to sodium. Six water quality parameters were found above the desirable level of WHO.

In addition to the mild rainfall and the runoff generated from this, groundwater contamination due to storm water infiltration on agricultural areas due to excess fertilization has been reported by [5], [6], [7]. The impact of agriculture on groundwater quality in terms of nitrogen has been reported by [4], [5], and [6].

Even though, many of the researchers have worked on Physico-chemical analysis of water both ground and surface water, excluding agriculture farm and related components, an attempt is being made to convey the quality aspects of ground water and surface water. In this paper, a Physico-chemical analysis of water such as: turbidity, acidity, hardness, fluorides, chlorides, nitrate, phosphate, and potash was carried out on the samples collected from 34 agriculture farms. A comparison of results is made with existing drinking water Indian standards.

II. THE STUDY AREA AND SAMPLING PLAN

Present study deals with the Physico-chemical analysis of surface and ground water resources in a village situated in Southern India, named *Panaje*, active in agriculture deeds and serves to be a major lifeline. Panaje village is located in Puttur Taluk of Dakshina Kannada district in Karnataka, India. It is situated approximately 20 km away from sub-district headquarter Puttur and 70 km away from district headquarter Mangalore. The climate is tropic with an annual rainfall of 2000 mm.

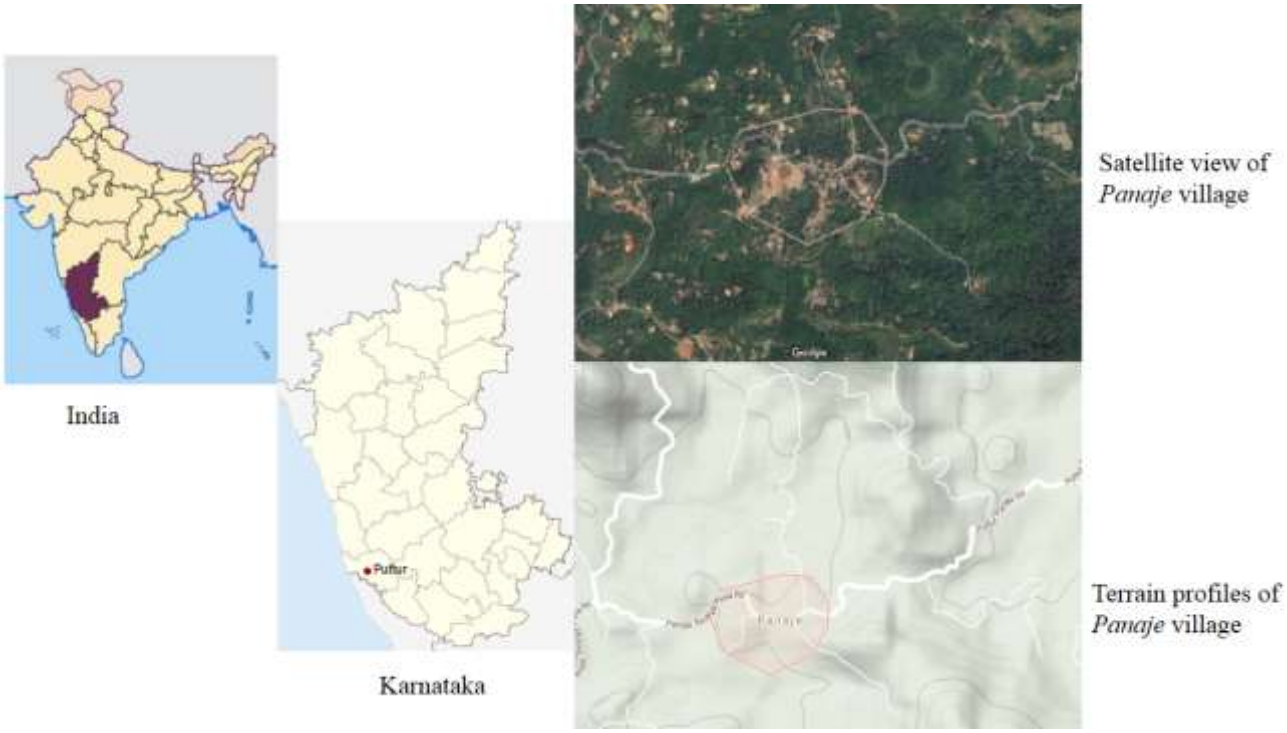

Figure 1: The study area

The samples collected are of two types, the first being from ground water resource and the second group of samples from surface water sources, located in different farms. Groundwater samples are demarked with the alphabet A, followed by the sampling location numbers from 1 to 23. Similarly, surface water samples were denoted with the alphabet B followed by the sampling location numbers from 1 to 11.

II. THE METHODOLOGY

Water samples are collected from the above mentioned sources and analysis is carried out as per the Indian Standards in the laboratory for various properties. Visual observations are also made for changes in the natural ecosystem in the farms. Information like amount/type of fertilizers applied, frequency of application, cultivation methods, crop yield and any other relevant information were gathered by the land owners of the agricultural farms. All results and information are compiled and inferences are drawn.

The laboratory tests carried out to examine the chemical and physical contents are of two folds: turbidity test, and chemical tests. Turbidity test is carried out by the standard digital Nephelo Turbidity operations. Methyl Orange Acidity and Phenolphthalein Acidity were adopted to attain the acidity of the samples.

By dipping the electrode of pH meter in the given unknown water sample, pH value of the samples were recorded. The Nessler tube approach is adopted in the measurement of fluoride content among the samples. In order to assess the contents of Nitrate (N), Phosphate (P) and Potash (K), commonly known as NPK, Spectrophotometer method is adopted. Standard solutions were made use of for the calibration of the instrument. For nitrate, standard solution of known concentration of sodium (Na) such as Sodium Hydroxide, for phosphate, standard solution is vanadate-molybdate, and for potash, standard solution used is KCl.

III. RESULT AND DISCUSSION

Detailed graphical representation of results are given in graph 2 to 17. From the results it is observed that the turbidity value for the ground water sample varies from 1 NTU to 13 NTU and least value of turbidity is observed in A7 and A12. The higher value of turbidity is observed in A18. All other samples are having readings in between this range. Turbidity value for the surface water sample varies from 4 NTU to 9 NTU and least value of turbidity is observed in B10. The higher value of turbidity is observed in B3 and this indicates the turbid nature of the sample. All other samples are having readings in between this range.

Figure 3 shows the variation of turbidity value of surface water sample for various farms. In addition to this, the pH values for the ground water samples varies from 5.80 to 8.18 and least value of pH is observed is in A19 and this indicates the acidic nature of sample. The higher value of pH is observed in A7 and this indicates the basic nature of the sample.

From the results it is observed that the pH value for the surface water sample varies from 5.55 to 7.52 and least value of pH is observed in B11 and this indicates the acidic nature of sample. Location B8 shows higher value of pH.

The acidic values for the ground water sample varies from 12mg/l to 36mg/l and least value of acidity is observed in A6 and this indicates the basic nature of sample. The higher value of acidity is observed in A2 and this indicates the acidic nature of the sample. Similarly, acidic values for the surface water sample varies from 12mg/l to 24mg/l and least value of acidity is observed in B5, B8and B10. The higher value of acidity is observed in B1 and this indicates the acidic nature of the sample. Figure 7 shows the variation of acidity value of surface water sample for various farms. Further, chloride value for the ground water sample varies from 8mg/l to 18mg/l and least value of chloride is observed in A2. From the results it is observed that the hardness value for the ground water sample varies from 12mg/l to 144mg/l and least value of hardness is observed in A13 and this indicates the water sample is soft compared to other samples. The higher value of hardness is observed in A3 and this indicates the hard nature of the sample. Hardness values for the surface water sample varies from 12mg/l to 40mg/l and least value of hardness is observed in B4 and this indicates the water sample is soft compared to other samples. Nitrate concentrations for the ground water sample varies from 11mg/l to 20mg/l and least value of nitrate is observed in A4. Likewise, nitrate value for the surface water sample varies from 17mg/l to 26mg/l and least value of nitrate is observed in B8. The other component, potassium value for the ground water sample varies from 1.1mg/l to 4.5mg/l and least value of potassium is observed in A7 and potassium value for the surface water sample varies from 1.1mg/l to 4.2mg/l and least value of potassium is observed in B9. The higher value of potassium is observed in B4. The phosphate value for the ground water sample varies from 0.1mg/l to 0.9mg/l and least value of phosphate is observed in A2, A5, A16, A17 and A23 the higher value of phosphate is observed in A8 and A12. The phosphate value for the surface water sample varies from 0.3mg/l to 0.9mg/l and least value of phosphate is observed in B6, B10.The higher value of phosphate is observed in B4, B5 and B11. Samples show a fluoride values from 0.05mg/l to 0.2mg/l and least value of fluoride is observed in A2, A4, and A9. The higher value of fluoride is observed in A14 and A21. The fluoride value for the surface water sample varies from 0.04mg/l to 0.3mg/l and least value of fluoride is observed in B4.

The ground and surface water resources of the farms where chemical fertilizers used, are considerably affected by Nitrogen (N), Phosphorous (P) and Potash (K). However the water samples of farms where bio-fertilizers are used showed lesser quantities of N, P and K concentrations.

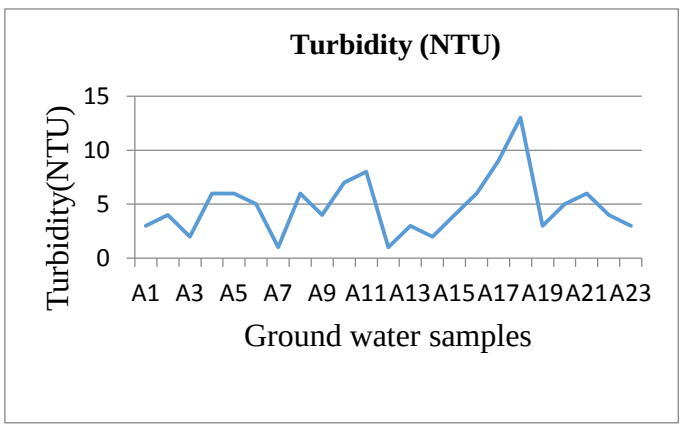

Figure 2: Variation of Turbidity for Ground Water Samples

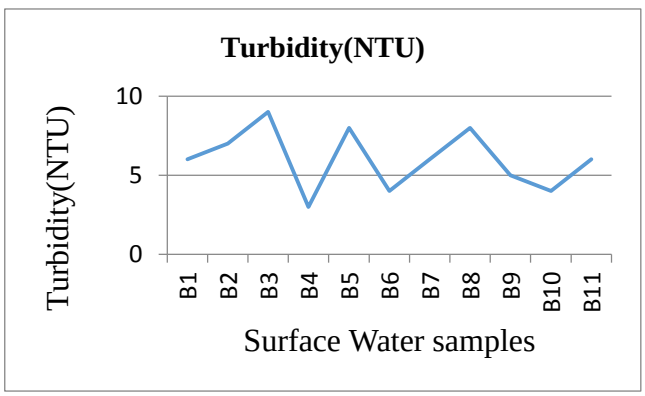

Figure 3: Variation of Turbidity for Surface Water Samples

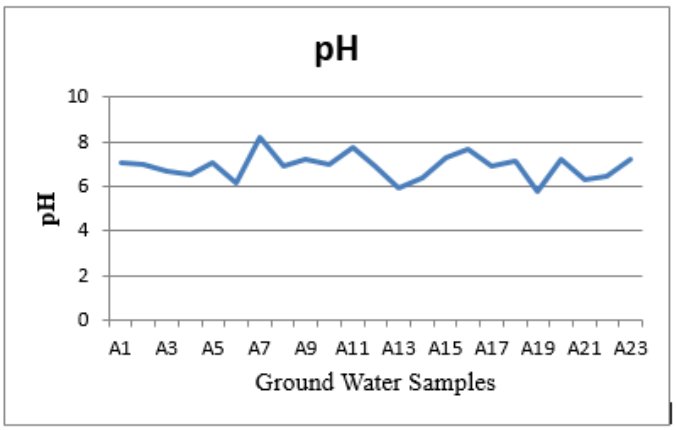

Figure 4: Variation of pH for Ground Water Samples

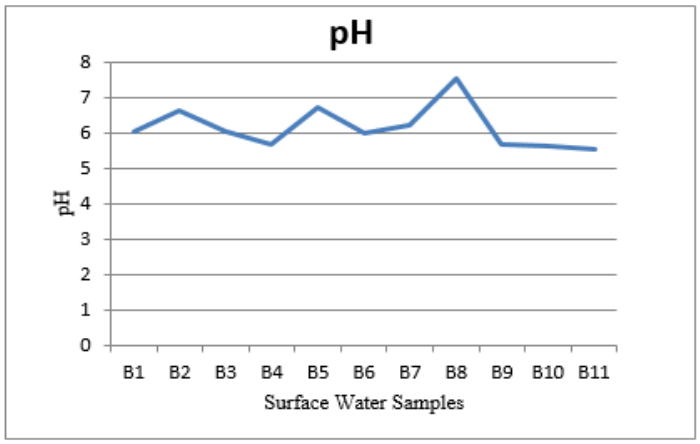

Figure 5:Variation of pH for Surface Water Samples

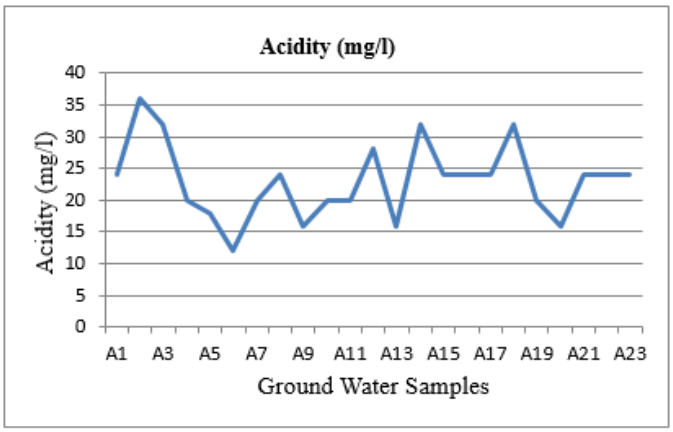

Figure 6: Variation of Acidity for Ground Water Samples

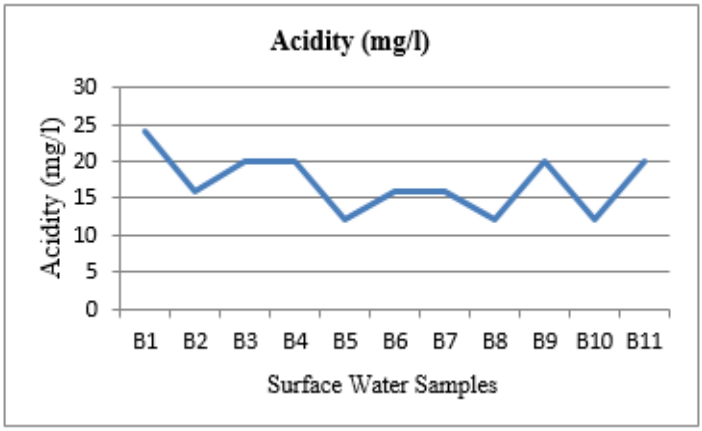

Figure 7: Variation of Acidity for Surface Water Samples

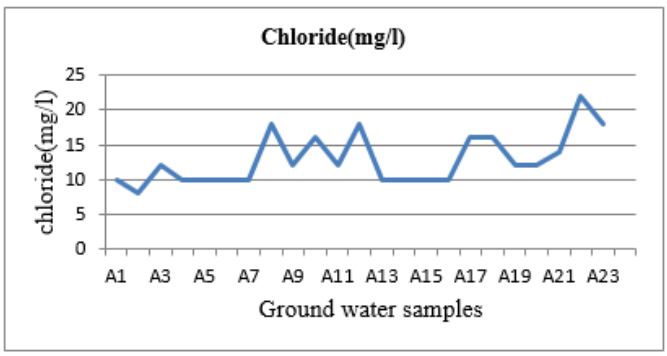

Figure 8: Variation of Chloride for Ground Water Samples

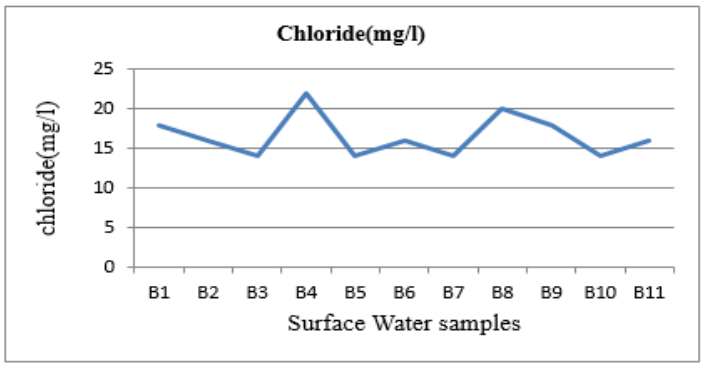

Figure 9: Variation of Chloride for Surface Water Samples

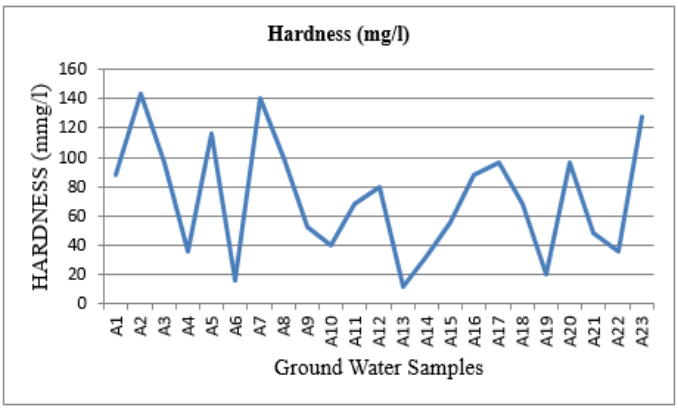

Figure 10: Variation of Hardness for Ground Water Samples

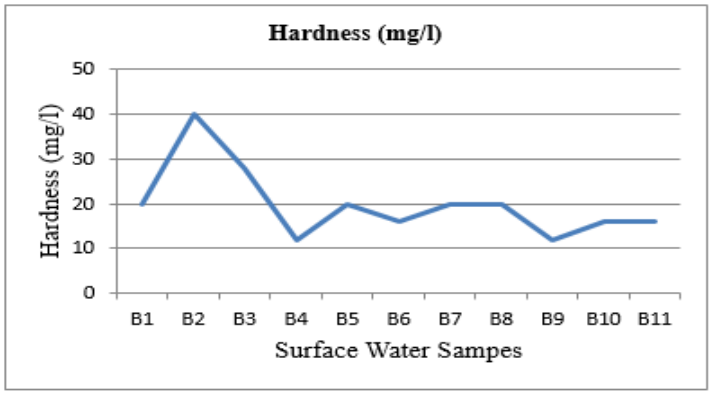

Figure 11: Variation of Hardness for Surface Water Samples

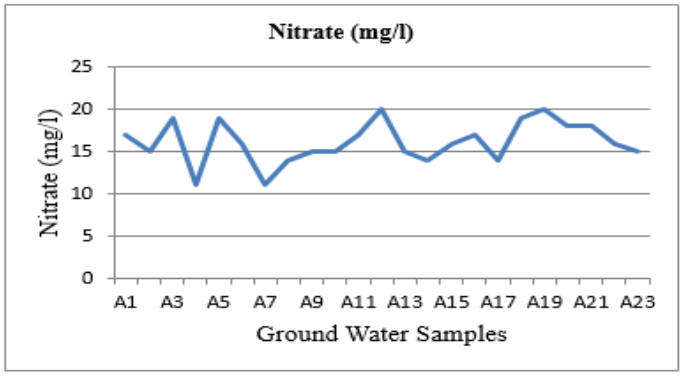

Figure 12: Variation of Nitrate for Ground Water Samples

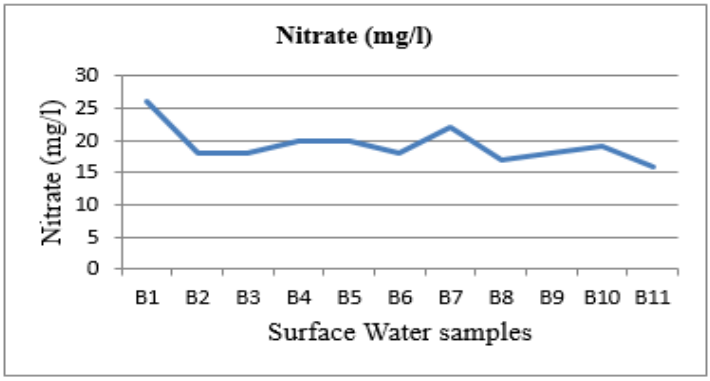

Figure 13:Variation of Nitrate for Surface Water Samples

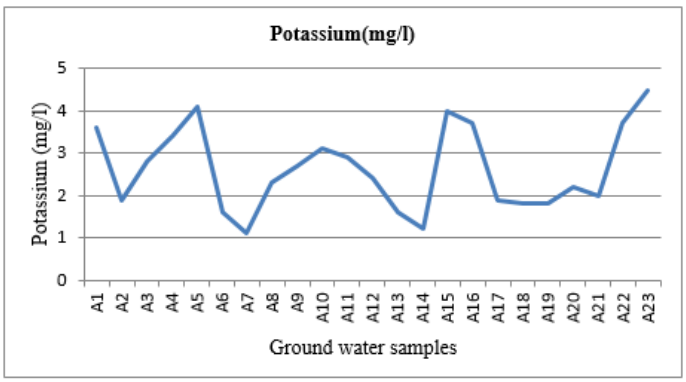

Figure 14: Variation of Potassium for Ground Water Samples

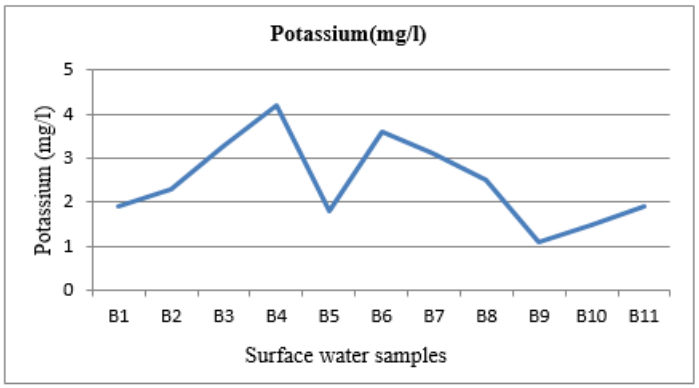

Figure 15: Variation of Potassium for Surface Water Samples

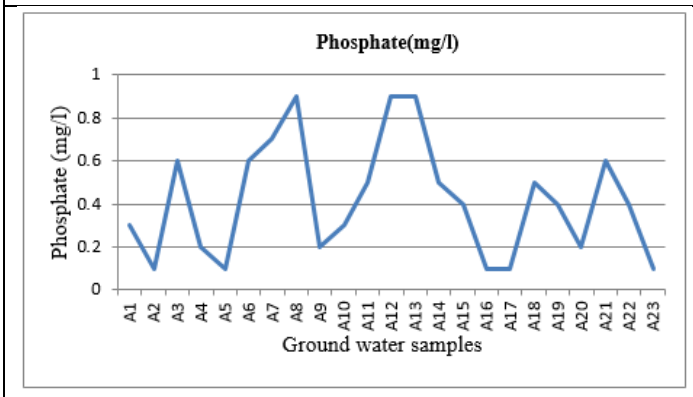

Figure 16: Variation of Phosphate for Ground Water Samples

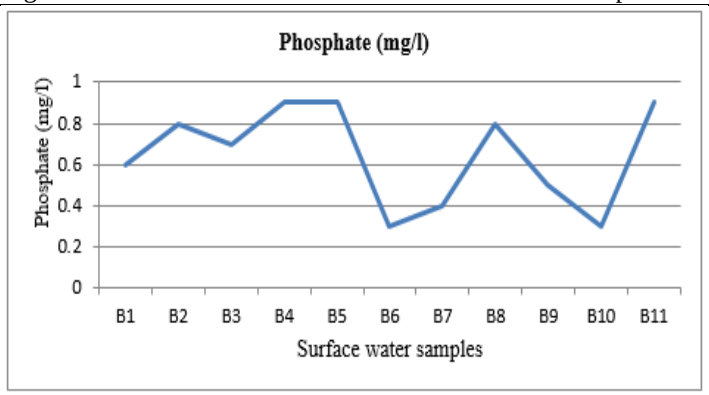

Figure 17: Variation of Phosphate for Surface Water Samples

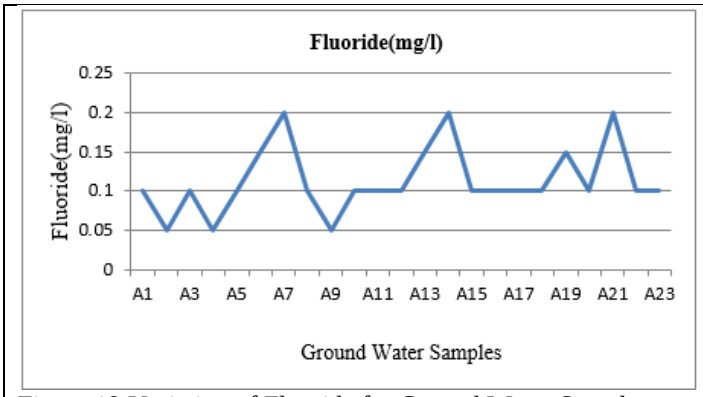

Figure 18:Variation of Fluoride for Ground Water Samples

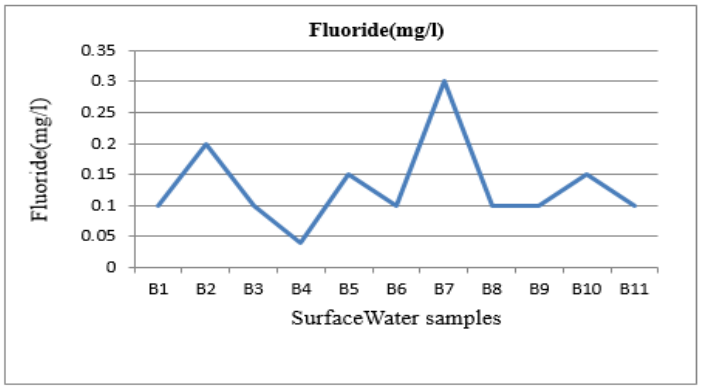

Figure 19:Variation of Fluoride for Ground Water Samples

IV. CONCLUSIONS

The present study aims at Physico-chemical analysis of samples taken from the ground and surface water resources of various farms located in Panaje Village. It is evident from the analysis that the ground and surface water resources of the farms where chemical fertilizers used, are considerably affected by Nitrogen (N), Phosphorous (P) and Potash (K), but, are well within the permissible limits, as per Burero of Indian Standards.

It is quite evident from the test results of ground and surface water resources that higher values of N, P and K are present in surface water resources as compared to ground water resources and interestingly, concentrations of N, P and K are reduced with respect to the depth of ground water source. Since, Panaje Village falls under heavy rain fall area, higher amount of runoff water and lesser rate of water percolation through the soil is observed. This leads to higher contamination of surface water resources than ground water resources.

REFFERENCE

1. *Michna, L., and E. L. Bourodimos. "Seepage Flows-Field Data Measurements for Evaluation of Potential Contribution of Fertilizers to Groundwater Pollution." Soil Science 115, no. 6 (1973): 401-408.*
2. *Datta, P. S., D. L. Deb, and S. K. Tyagi. "Assessment of groundwater contamination from fertilizers in the Delhi area based on 180, N03− and K+ composition." Journal of Contaminant Hydrology 27, no. 3-4 (1997): 249-262.*
3. *Pékný, V., J. Skořepa, and J. Vrba. "Impact of nitrogen fertilizers on groundwater quality-some examples from Czechoslovakia." Journal of contaminant hydrology 4, no. 1 (1989): 51-67.*
4. *Visarto, Preap, Meron P. Zalucki, Harry J. Nesbitt, and Gary C. Jahn. "Effect of fertilizer, pesticide treatment, and plant variety on the realized fecundity and survival rates of brown planthopper, Nilaparvata lugens (Stål)(Homoptera: Delphacidae)—generating outbreaks in Cambodia." Journal of Asia-Pacific Entomology 4, no. 1 (2001): 75-84.*
5. *Fließbach, Andreas, Paul Mäder, Amadou Diop, L. W. M. Luttikholt, N. Scialabba, U. Niggli, Paul Heyyerly, and T. La Salle. "Mitigation and adaptation strategies-organic agriculture." In IOP Conference Series: Earth and Environmental Science, vol. 6, no. 24, p. 2025. 2009.*
6. *Abram, Aleksander, and D. Lynn Forster. "A primer on ammonia, nitrogen fertilizers, and natural gas markets." The Ohio State University (2005).*
7. *Enwall, Karin, Laurent Philippot, and Sara Hallin. "Activity and composition of the denitrifying bacterial community respond differently to long-term fertilization."Applied and environmental microbiology 71, no. 12.*