RESEARCH FRONT

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STUDY OF PHYSICO-CHEMICAL PARAMETERS OF WATER AND SOIL FROM SOME VILLAGES SURROUNDING VITA, SANGLI DISTRICT MAHARASHTRA

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ABSTRACT

Water and soil are very important in all living and non living ones on this earth. In present study we have collected water and soil samples from random villages near to Vita, Sangli District like Shelkbav, Chitali, Wangi, Bhood, Bhalvani, Alsand and Mahuli. These samples were averagely collected and analyzed for some parameters like pH, conductivity, chlorides, total solids, organic carbon, water holding capacity etc. The results were compared with WHO and Indian Ministry permissible limit values. It is observed in results all villages are good quality of water and soil but still by the observation we suggest that people should use some treatment for water before drink and try to increase the use of organic fertilizers to increase fertility instead of synthetic fertilizers.

Key words: Water analysis, Soil analysis, Vita, drinking water, soil fertility

INTRODUCTION

Water is most essential for existence of life on earth and is a major component for all forms of lives, from micro-organism to human being. Various physico- chemical parameters have a significant role in determining the quality of drinking water. As per World Health Organization (WHO), safe and wholesome drinking water is a basic need for human development, health and well being, and it is an internationally accepted human right [1]. Water intended for human consumption must be free from harmful microorganisms, toxic substances, excessive amount of minerals and organic matter. Over burden of the population pressure, unplanned urbanization, unrestricted exploration and dumping of the polluted water at inappropriate place enhance the infiltration of harmful compounds to the water [2]. In the recent few decades, India has seen the large-scale urbanization, industrialization and technological development. However, progress has accompanied by a growing negative impact on the environment in terms of its pollution and degradation [3].

Along with water soil is the most vital and precious natural resource that sustains life on the earth. It takes almost 1000 years to produce an inch of top soil [4]. One of the major concerns in today's world is the pollution and contaminations of soil. The degradation of soil has stared occurring both due to natural and human induced factors which in turn affecting the productivity. As human population continue to increase, human disturbance of the earth's ecosystem to produce food and fiber will place greater demand on soils to supply essential nutrients. The soils native ability to supply sufficient nutrients has decreased with higher plant productivity levels associated with increased human demand for food [5]. Therefore one of the greatest challenges today is to develop and implement soil, crop and nutrients management technologies that enhance the plant productivity and the quality of soil, water and air. If we do not improve the productive capacity of our fragile soils, we cannot continue to support the food and fiber demands of our growing population [6].

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In this study we have analyzed some physico-chemical parameters of soil and water samples. The samples analysis of soil and water has given the information regarding its condition regarding drinking ability and soil fertility. In water we have studied parameters like pH, total solid, total dissolved solid, conductivity, alkalinity, hardness and chloride while soil has been analyzed for few parameters like pH, water holding capacity, organic carbon, chloride and conductivity. We have selected these parameters due to their importance in the quality of water and soil and in human life. There are some limit values for each parameter has given by WHO as well as health and works and housing ministries of each country in world. These parameters if exceeds and cross their barrier then will be harmful to living ones.

MATERIALS AND METHOD

Area Selection

We have selected some villages near to Vita, Sangli District Maharashtra. The selected villages are Chitali wangi, Bhalvani, Shelkbav, Gardi, Bhood, Mahuli and Alsand. The selection has based on the criterion, these are few representative villages where from students are coming in large quantity to the Balwant College, Vita and we are interested to know about their water and soil quality. The area is of analysis is spread over 25km south and north direction from Vita, Sangli District Maharashtra. The samples were collected in month of January and may vary the result with season to season.

Sample Preparation

Drinking water samples were collected from these villages in clean samplers about 1lit and analyzed for the various parameters. Water samples were collected from bore-well and municipal water supplies to villages. Given readings for analysis are average values from the same village. Soil samples were collected throughout the villages and analyzed. Here we have given the average observations of five different samples. The soil samples were collected in 3 ways and made one sample for each field. Sample first was collected from upper layer second sample was collected from below half or up to one feet and third samples were collected from below one and half feet.

ANALYSIS OF SAMPLES

Samples from water and soil were collected and prepared and further procedures were carried out with respect to standard procedures [7, 8]. The results may carry ± error also standard deviation.

Result And Discussion

Study of pH

Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters. Careful attention to pH control is necessary at all stages of water treatment to ensure satisfactory water clarification and disinfection. No health-based guideline value is proposed for pH. The 1958 WHO International Standards for Drinking-water suggested that pH less than 6.5 or greater than 9.2 would markedly impair the potability of the water. The 1963 and 1971 International Standards retained the pH range 6.5–9.2 as the allowable or permissible range. In the first edition of the Guidelines for Drinking-water Quality, published in 1984, a guideline value pH range of 6.5–8.5 was established for pH, based on aesthetic considerations [9,10]. The study has been carried out with standard procedure and from fig. 1 it is clearly observed that all samples are having pH within desirable limits suggested by WHO [9] as well as Indian Works and housing ministry [8].

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The supply of plant nutrients and thus the fertility of the soil are affected by pH. The solubility of most nutrients varies in response to pH. As acidity increases, the loss of these nutrients by leaching increases and their availability to plants decreases [6]. The quantity of some nutrients may rise so greatly under acidic and alkaline conditions that they become toxic to plants [11]. Therefore, it is very essential to control soil pH between 6.5 to 7.5 where most of the nutrients are available to plants for maintaining soil fertility [12]. In the present study, pH ranges from 7.2 to 8.3 reflecting alkaline nature of soils. It is interesting to observe a narrow range of variation in pH in the area. This can be attributed to buffering capacity of the soils and absence of carbonate in the saturation extract [13]. These values are possibly due to presence of soluble and exchangeable sodium along with HCO_3^- ions, which precipitates calcium and magnesium carbonates during evaporation. More than neutral pH values are thus indicative of development of salinity in the area. These results were in confirmatory with the results reported by several workers [14-15]. Alsand, Vita, Bhood and wangi are having pH about 8 but remaining villages also up to desirable range (Fig. 3). These pHs are due to excess water supplies and fertilizers. So we suggest that farmers should manage the water and fertilizer to the field.

Study of conductivity

Water conductivity is the important criterion. This parameter is played vital role to get the idea about presence of dissolved solid which is one of the major factor responsible for the water disturbance. In our study it has been observed that Bhalvani, Wangi, Shelkabav and Alsand village having the conductivity more than 1ohms cm^{-1} (Fig. 1). The observations revealed that there is addition of maximum ions into the water bodies due to which the conductivity is increased.

The conductivity in the saturation extract is used as an index for grading the soil type. It is characterized by cations like sodium, potassium, calcium and magnesium and anion like chlorides, sulphates, bicarbonates, phosphates and nitrates [6]. The conductivity by soil samples from all the villages it was found that all is having conductivity more than 1ohms cm^{-1} (Fig. 3). All villages are using various fertilizers and metal ion content nutrients to increase soil fertility. We suggest that farmers should use the organic fertilizers in controlled manner.

Study of Chloride

Chloride in drinking-water originates from natural sources, sewage and industrial effluents, urban runoff containing de-icing salt and saline intrusion. The main source of human exposure to chloride is the addition of salt to food, and the intake from this source is usually greatly in excess of that from drinking-water. Excessive chloride concentrations increase rates of corrosion of metals in the distribution system, depending on the alkalinity of the water. This can lead to increased concentrations of metals in the supply. However, chloride concentrations in excess of about 250 mg/l can give rise to detectable taste in water [9]. In our studies it is observed that all villages are having controlled salinity or chloride contents (Fig. 2) [8].

In soil we observed that there is less content of chloride ions (Fig. 3). The presence of chloride ions is indirectly salinity of the soil and samples we were collected is having less amount and it is essential to crop production.

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Study of total solid

The palatability of water with a total solid level of less than 600 mg/litre is generally considered to be good; drinking-water becomes significantly and increasingly unpalatable at total solid levels greater than about 1000 mg/l. The presence of high levels of total solid may also be objectionable to consumers, owing to excessive scaling in water pipes, heaters, boilers and household appliances. [9]. In our study we have observed that all are having the limited and controlled values of total solid (Fig. 2).

Alkalinity

Usually water shows alkalinity due to presence of salts of weak acids and strong bases. The alkalinity in water is caused due to presence of carbonates, bicarbonates and hydroxides. In our study there is higher quantity of alkalinity is observed. Among all villages Chitali and wangi are having highest alkalinity (Fig. 2). We have observed pH in alkaline but still we have been tested acidity and it was absent in all samples.

Hardness of Water

Hardness caused by calcium and magnesium is usually indicated by precipitation of soap scum and the need for excess use of soap to achieve cleaning. Public acceptability of the degree of hardness of water may vary considerably from one community to another, depending on local conditions. In particular, consumers are likely to notice changes in hardness. The taste threshold for the calcium ion is in the range of 100–300 mg/l, depending on the associated anion, and the taste threshold for magnesium is probably lower than that for calcium. In some instances, consumers tolerate water hardness in excess of 500 mg/l. Depending on the interaction of other factors, such as pH and alkalinity, water with hardness above approximately 200 mg/l may cause scale deposition in the treatment works, distribution system and pipe work and tanks within buildings. It will also result in excessive soap consumption and subsequent “scum” formation. On heating, hard waters form deposits of calcium carbonate scale. Soft water, with a hardness of less than 100 mg/l, may, on the other hand, have a low buffering capacity and so be more corrosive for water pipes [9]. In study we have observed that all samples are having crossed the limit values (fig. 2). We suggest to users of the respective villages that they should do treatment or filtration process to soft before drink it.

Organic Carbon

The organic matter is a vital store of available nutrients. It helps to sustain soil fertility by improving soil structure, retention of mineral nutrients, increasing water holding capacity, water infiltration, drainage, aeration and root penetration. It also helps to increase the amount of soils flora and fauna [16,17]. Thus the organic matter is an important contributes to soil fertility. It comes in a soil from remains of plants and animals. However, in addition to this, it also includes grasses, trees, bacteria, fungi, protozoa, earthworm and animal manure. It is obtained by estimating organic carbon from soil [18]. In our study we observe the nearly same concentration in all villages samples (Fig. 3).

Water holding capacity

Water holding capacity is the vital parameter for crop production. It is observed in fig. 4 soil of each village is having good water holding capacity. Among all Chitali and Wangi village soil has richer with more water holding capacities.

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CONCLUSION

In present study we have analysed some parameters of water and soil samples. The study has been carried out with considering the average values from villages. Water quality on these parameter basis and with guideline of WHO it may say that it is safe to drinking purpose but still there is maximum availability of hardness in each village so needs to care of water sources as well as used some filtration process at home before drink the water. In soil study it may conclude that the soil is rich for farming purpose but on basis of parameters it may say that there is need of to use the organic fertilizers and should supply water to farm in controlled manner.

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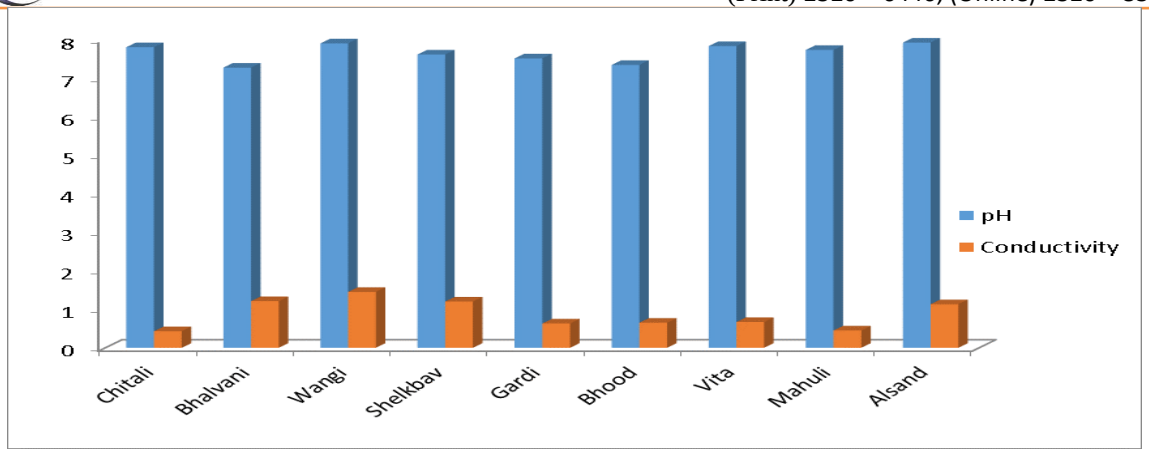

Fig. 1 Water analysis for the parameters pH, total solids, total dissolved solids, and conductivity

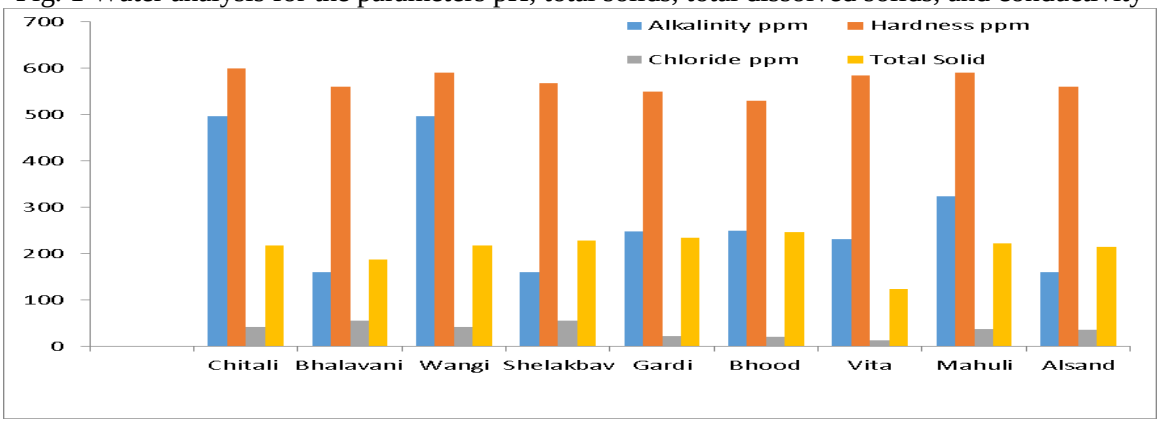

Fig. 2 Water analysis for the parameters Alkalinity, hardness and chloride contents

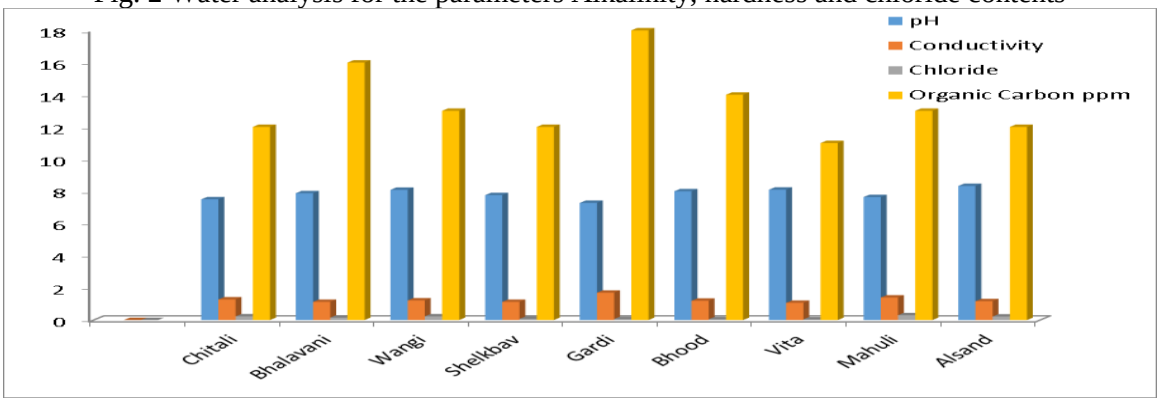

Fig. 3 Soil analysis for the pH, Conductivity, chloride content and organic carbon

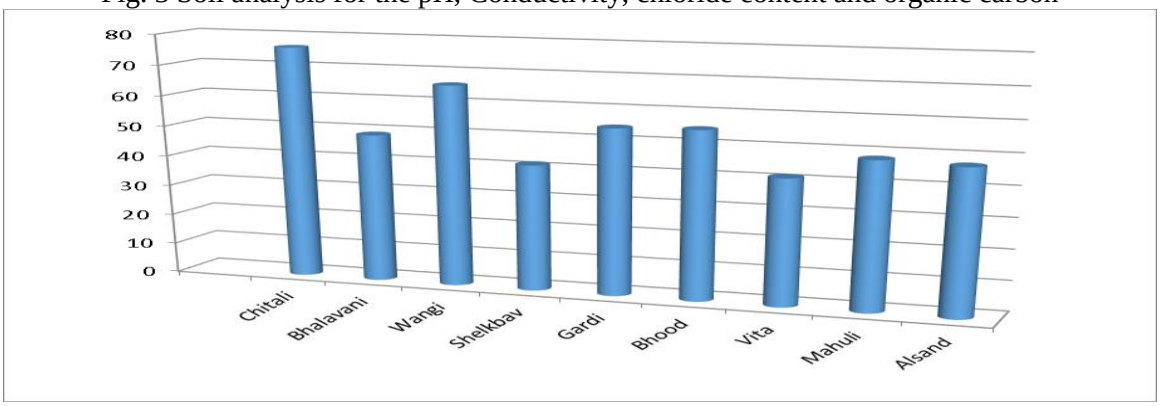

Fig. 4 Water holding capacity of Soil with respect to villages