EFFECT OF INORGANIC FERTILIZER ON SURFACE WATER AND GROUND WATER

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Abstract- *Agriculture has always remained back bone of economy and socio-political stability of developing countries and employee's largest work force in India. The continuous use of inorganic fertilizer alone causes degradation of soil organic matter, soil acidity, environmental pollution, heavy metal accumulation and if there is a rainfall shortly after they are applied them the fertilizer wash away and can pollute streams, ponds, other water bodies and it leads to pollute the underground water. If the living organism consumes the affected one it will cause the same harmful affects to them it leads to toxic. Generally, we think the usage of inorganic fertilizer in cultivated land may be considered as a minor issue but the real fact is they become a globalized issue. Hence in our project, soil samples collected from various crops cultivated location such as Rice, Maize and Sugarcane to analyze the fertilizer and pesticides contaminates by conducting various tests and our test results is compared with World Health Organization standards. Also our study aims to provide recommendation towards solving this problem and to create awareness to the farmers about the effects of inorganic fertilizers on soil and ground water.*

Keywords: Agriculture, Inorganic fertilizer, Environmental pollution, Aquatic ecosystem, Globalized issue, Improper fertilization, Problem solving.

I. INTRODUCTION

Agriculture is the science and art of cultivating plants and livestock. Agriculture was the key development in the rise of sedentary human civilization, The use of manure and composts as fertilizers is probably almost as old as agriculture. Modern chemical fertilizers include one or more of the three elements that are most important in plant nutrition: nitrogen, phosphorus, and potassium. of secondary importance are the elements sulfur, magnesium, and calcium.

Most nitrogen fertilizers are obtained from synthetic ammonia; this chemical compound (NH3) is used either as a gas or in a water solution, or it is converted into salts such as ammonium sulfate, ammonium nitrate, and ammonium phosphate, but packinghouse wastes, treated superphosphate and triple superphosphate preparations are obtained by the treatment of calcium phosphate with sulfuric and phosphoric acid, respectively. Potassium fertilizers, namely potassium chloride and potassium sulfate, are mined from potash deposits. Mixed fertilizers contain more than one of the three major nutrients nitrogen, phosphorus, and potassium. Mixed fertilizers can be formulated in hundreds of ways. Fertilizer use is very expensive and can harm the environment if not used correctly. Therefore, before adding fertilizer, farmers send a soil sample to a laboratory for baseline testing. By testing their soil, farmers know which nutrients and how much to apply to the soil. If too little is added, crops will not produce as much as they should. If too much is added, or at the wrong time, excess nutrients will run off the fields and pollute streams and groundwater. So, while fertilizers serve an important purpose, farmers must be careful to use the right amount, at the right time, to avoid potential negative effects to the environment. Ammonium and Potassium salts. Problems caused by too much fertilizer: The amount of nitrate may increase in drinking water and rivers as a result of high levels of nitrogen fertilizer use. The amount of phosphate may increase in drinking water and rivers as a result of the transport of phosphorous fertilizer with the flow of surface. High level of Nitrogen fertilizer used plants grown in soils. It consists of carcinogenic substances such as nitrosamines, especially plants such as lettuce and spinach leaves are eaten. There are harmful accumulation of NO3 and NO_2. For increasing agricultural production and productivity, use of chemical inputs such as pesticides has increased. Pesticides are chemical substances that are meant to kill pests. In general, a pesticide is a chemical or a biological agent such as a virus, bacterium, antimicrobial, or disinfectant that deters, incapacitates, kills, pests. It is commonly used to eliminate or control a variety of agricultural pests that can damage crops and livestock and reduce farm productivity. Pesticides have proved to be the farmers as well as people all around the world by increasing agricultural yield. Basically, the input of pesticides in Indian agriculture increases after the announcement of Green Revolution which in turn helps our country to fight the major problem of food crises. Although the application of pesticides serves as a boon but also had a long term negative effect of harming the environment and human health.

The current issue of hazard posed by pesticides to human health and the environment has raised concerns. Production of better alternative to reduce pesticide formulations is an answer to this destruction condition. If the pesticides are used in appropriate quantities and used only when required necessary or opting for organic farming, then pesticide risks can be tackled to some extent. Water pollution is on the rise due to these pesticides, even at low concentration, these pesticides have serious threat to the environment. The data for the last two decades regarding pesticide exposure and human health revealed that several pesticides cause neuronal disorder and degenerative diseases, some effect fetal growth and cause congenital anomalies and other are carcinogenic for human . Over the past three decades, the indiscriminate use and improper handling of pesticides in agriculture have caused serious human health problems in many developing countries.

II WATER

Physical Properties

1. Turbidity of Water

The turbidity is measured by a turbidity rod or by a turbidity meter with optical observations and is expressed as the amount of suspended matter in mg/l or parts per million (ppm). For water, ppm and mg/l are approximately equal. The standard unit is that which is produced by one milligram of finely divided silica (fuller's earth) in one litre of distilled water.

2. Colour

The presence of colour in water is not objectionable from health point of view, but may spoil the colour of the clothes being washed. The standard unit of colour is that which is produced by one milligram of platinum cobalt dissolved in one litre of distilled water. For public supplies, the colour number on cobalt scale should not exceed 20 and should be preferably less than 10.

3. Taste and Odour

The extent of taste or odour present in a particular sample of water is measured by a term called odour intensity, which is related with the threshold odour or threshold odour number. Water to be tested is therefore gradually diluted with odour free water, and the mixture at which the detection of odour by human observation is just lost, is determined. The number of times the sample is diluted represents the threshold odour number. For public supplies, the water should generally free from odour, i.e. the threshold number should be 1 and should never exceed 3.

4. Temperature of Water

For potable water, temperature of about 10^0C is desirable. It should not be more than 25^0C.

Chemical Properties of Water

1. Total Solids and Suspended Solids (T. S and S.S)

Total solids (suspended solids + dissolved solids) can be obtained by evaporating a sample of water and weighing the dry residue left and weighing the residue left on the filter paper.

The suspended solid can be found by filtering the water sample. Total permissible amount of solids in water is generally limited to 500 ppm.

2. pH value of Water

$$\mathrm{pH} = -\log[H^+] = \log\left[\frac{1}{H^+}\right]$$

If H^+ concentration increases, pH decreases and then it will be acidic.

If H^+ concentration decreases, pH increases and then it will be alkaline.

$$[H^+][OH^-] = 10^{-14}$$

$$\mathrm{pH} + \mathrm{pOH} = 14$$

If the pH of water is more than 7, it will be alkaline and if it is less than 7, it will be acidic.

The alkalinity is caused by the presence of bicarbonate of calcium and magnesium or by the carbonates of hydroxides of sodium, potassium, calcium and magnesium.

Some, but not all of the compounds that cause alkalinity also cause hardness.

3. Hardness of Water

Hard waters are undesirable because they may lead to greater soap consumption, scaling of boilers, causing corrosion and incrustation of pipes, making food tasteless etc. It is caused by sulphates, chlorides, nitrates of Ca and Mg. The prescribed hardness limit for public supplies range between 75 to 115 ppm.

4. Chloride Content

The chloride content of treated water to be supplied to the public should not exceed a value of about 250 ppm. The chloride content of water can be measured by titrating the water with standard silver nitrate solution using potassium chromate as indicator.

5. Nitrogen Content

It indicates fully oxidized organic matter in water (representing old pollution). Nitrites is highly dangerous and therefore the permissible amount of nitrites in water should be nil. Ammonia nitrogen + organic nitrogen = kjeldahl nitrogen. Nitrates in water is not harmful. However the presence of too much of nitrates in water may adversely affect the health of infants. The nitrate concentration in domestic water supplies is limited to 45 mg/l.

6. Biological Oxygen Demand (BOD):

The extent of organic matter present in water sample can be estimated by supplying oxygen to this sample and finding the oxygen consumed by the organic matter present in water. This oxygen demand is known as Biological oxygen demand (BOD).

III WATER SAMPLE COLLECTION

Ground water sample and Surface water sample was collected from agricultural field of rice, sugarcane and corn.

Determination of contents present in water

1. pH

The pH and temperature of water samples were measured by pH meter.

2. Total Dissolved Solids (TDS)

Solids refer to matter dissolved or suspended in water. Solids may effect on water quality adversely in a number of ways. The TDS of all water samples were carried out at room temperature by using TDS meter. TDS meter was washed with distilled water and was cleaned with tissue paper.

3. Electrical Conductivity

The conductivity of the water samples were measured by using pre-calibrated conductivity meter. Before measurement of the conductivity the electrode and beaker must be washed several times with distilled water and the sample under test. The measurement was taken at room temperature. The samples were transferred into beaker in sufficient volume to dip the electrode and then the scale was set before the conductivity of each sample was then noted.

4. Total Hardness

Total hardness of water samples were carried out by using titration method with EDTA solution.

5. COD and BOD

Chemical oxygen demand (COD) of all water samples were carried out by using dichromate refluction method and Biochemical oxygen demand (BOD) were carried out by using alkali azide method.

7. Alkalinity

Alkalinity is the measure of hydroxide and carbonate ion content of water sample. Water sample is titrated with standard HCl using indicator.

8. Chlorides and Dissolved oxygen

This test was carried out to evaluate the quantitative determination of chloride ions. This test was carried out by titrating given water sample with silver nitrate solution; end point was yellow to brick red. Dissolved oxygen (DO) of water samples were carried out by using titremetric method.

IV RESULT AND DISCUSSION

The following test were taken and their results were compared with WHO Standards

Table 1 Nitrate and phosphate content of water

Samples	Nitrate(mg/L)	Phosphate (ppm)
Ground water for rice	42	0.65
Surface water for rice	60	0.85
Ground water for sugarcane	37	0.45
Surface water for sugarcane	50	1.7
Ground water for corn	17	0.13
Surface water for corn	17	0.23

Table 2 COD and BOD content of water

Samples	COD (mg/l)	BOD (mg/l)
Ground water for rice	112	62.95
Surface water for rice	164	14.2
Ground water for	95	11.7
Surface water for	160	1.7
Ground water for corn	95	10.45
Surface water for corn	160	5.45

Table 3 Contents present in sugarcane water sample

S.No	Tests	Crop: Sugarcane	
		Ground Water	Surface Water
1	pH	7.4	7.6
2	Electric conductivity (dsm)	0.79	0.81
3	Bicarbonate (m.eq/litre)	6.0	8.8
4	Chloride (m.eq/litre)	4.1	2.4
5	Calcium (m.eq/litre)	2.0	0.40
6	Magnesium (m.eq/litre)	1.9	4.6
7	Sodium (m.eq/litre)	25.8	20.1
8	Pottasium (m.eq/litre)	0	1.3
9	Residual Sodium carbonate (m.eq/litre)	2.1	3.8

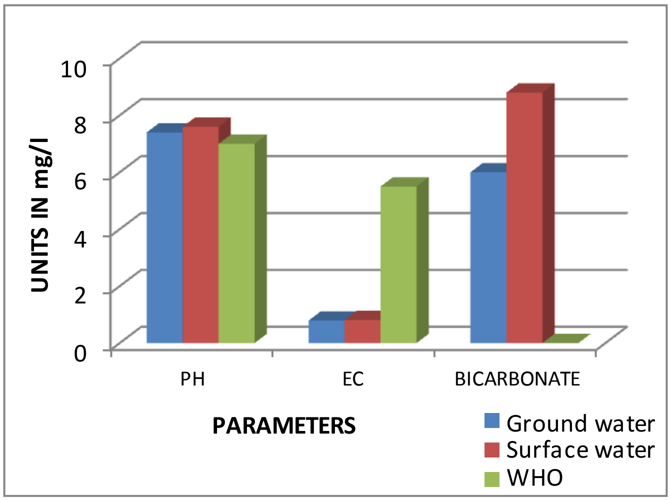

Figure 1 Chart shows comparison of water sample pH, EC, Bicarbonate with WHO standards

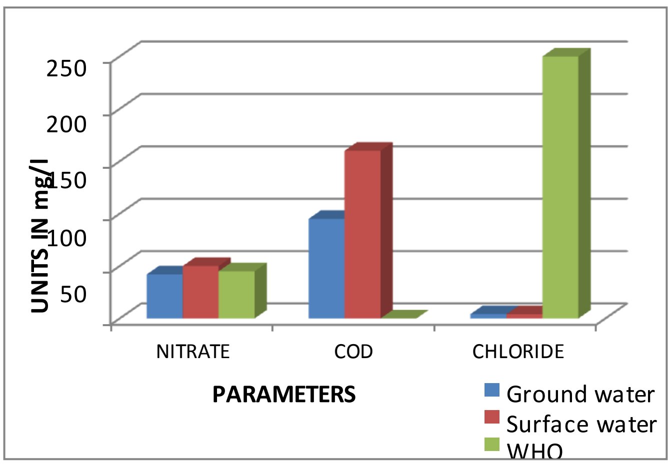

Figure 2 Chart shows comparison of water sample Nitrate, COD, Chloride with WHO standards

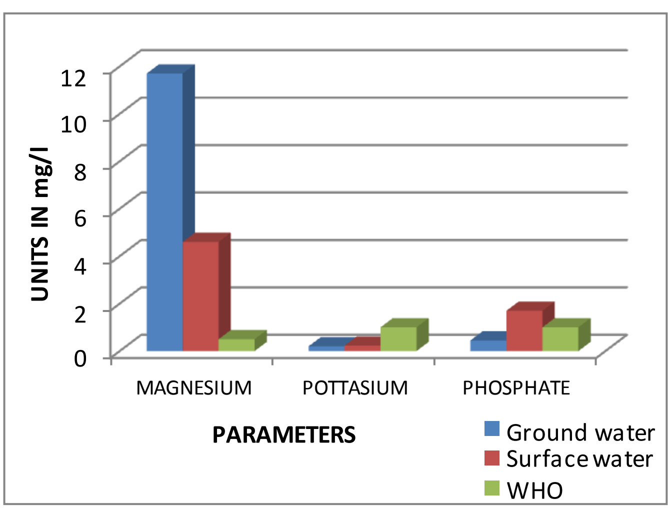

Figure 3 Chart shows comparison of water sample Magnesium, Potassium, Phosphate with WHO standard

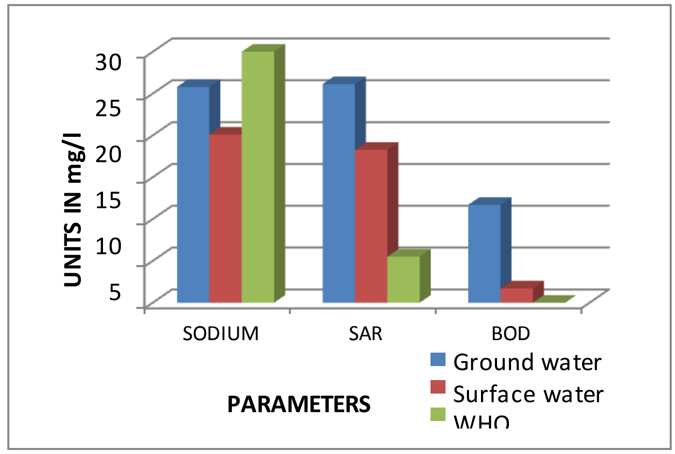

Figure 4 Chart shows comparison of water sample Sodium, SAR, BOD with WHO standards

Table 4 Contents present in Rice water sample

S.No	Tests	Crop: Rice	
		Ground Water	Surface Water
1	pH	6.1	6.4
2	Electric conductivity (dsm)	0.80	1.00
3	Bicarbonate (m.eq/litre)	6.2	6.8
4	Chloride (m.eq/litre)	3.0	3.4
5	Calcium (m.eq/litre)	2.6	2.7
6	Magnesium (m.eq/litre)	3.4	4.9
7	Sodium (m.eq/litre)	5.6	5.3
8	Pottasium (m.eq/litre)	0.37	0.45
9	Residual Sodium carbonate (m.eq/litre)	0.2	0.4
10	Sodium Absorbant Ratio	4.57	4.60

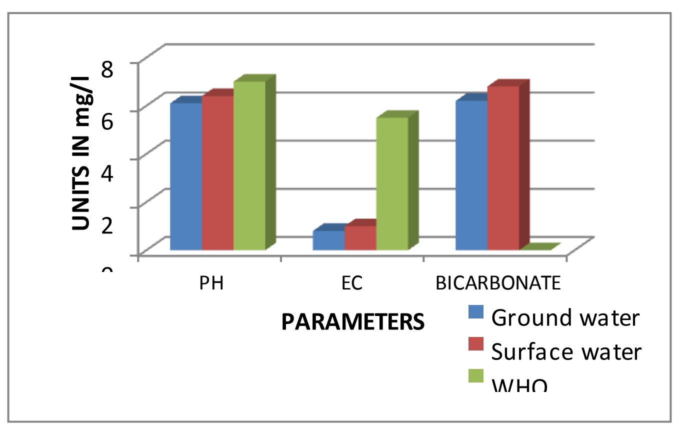

Figure 5 Chart shows comparison of water sample pH, EC, Bicarbonate with WHO standards

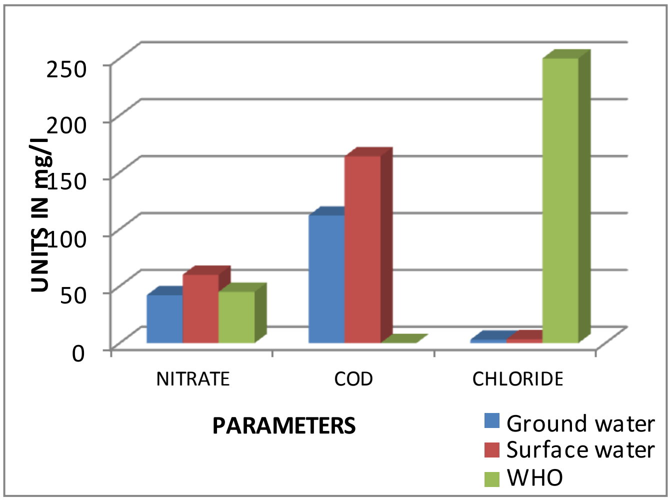

Figure 6 Chart shows comparison of water sample Nitrate, COD, Chloride with WHO standards

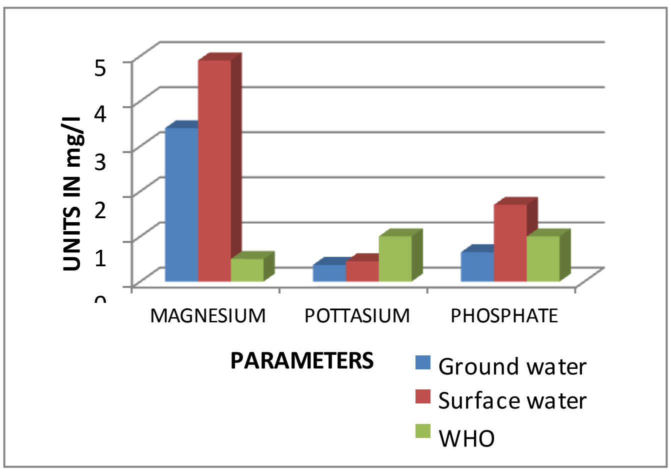

Figure 7 Chart shows comparison of water sample Magnesium, Potassium, Phosphate with WHO standard

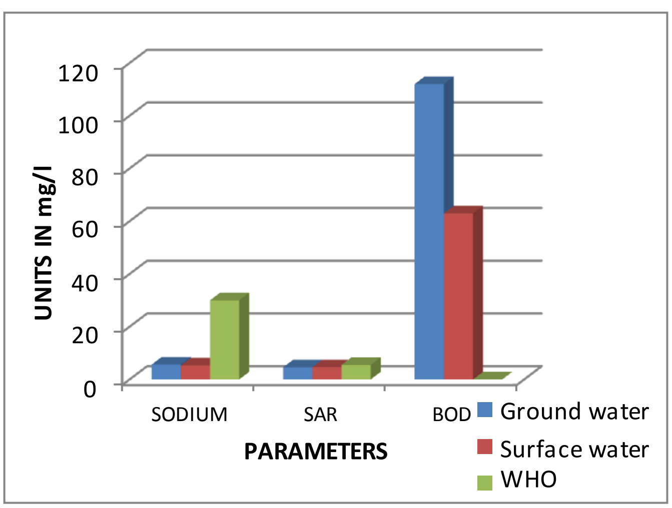

Figure 8 Chart shows comparison of water sample Sodium, SAR, BOD with WHO standards

Table 5 Contents present in Cron water sample

S.No	Tests	Crop: Cron	
		Ground Water	Surface Water
1	pH	6.9	6.7
2	Electric conductivity (dsm)	1.10	0.90
3	Bicarbonate (m.eq/litre)	12.0	9.8
4	Chloride (m.eq/litre)	2.0	2.0
5	Calcium (m.eq/litre)	1.9	1.4
6	Magnesium (m.eq/litre)	4.6	2.6
7	Sodium (m.eq/litre)	10.4	5.4
8	Pottasium (m.eq/litre)	0.20	0.23
9	Residual Sodium carbonate (m.eq/litre)	5.5	5.8
10	Sodium Absorbant Ratio	8.18	5.4

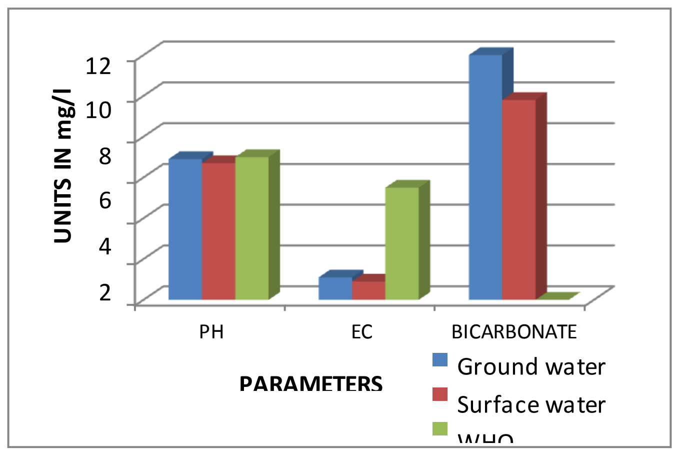

Figure 9 Chart shows comparison of water sample pH, EC, Bicarbonate with WHO standards

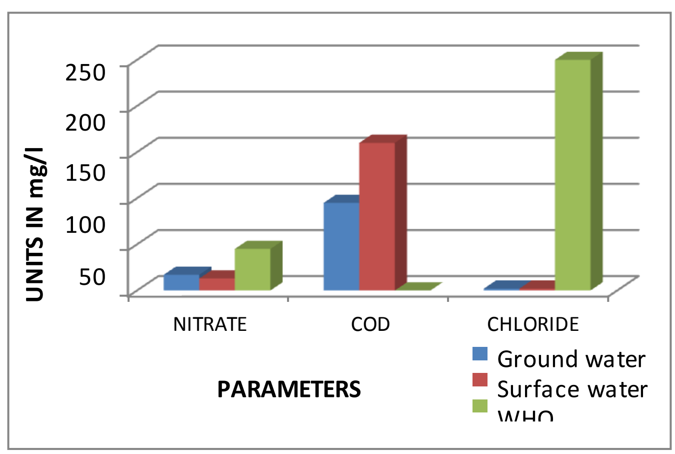

Figure 10 Chart shows comparison of water sample Nitrate, COD, Chloride with WHO standards

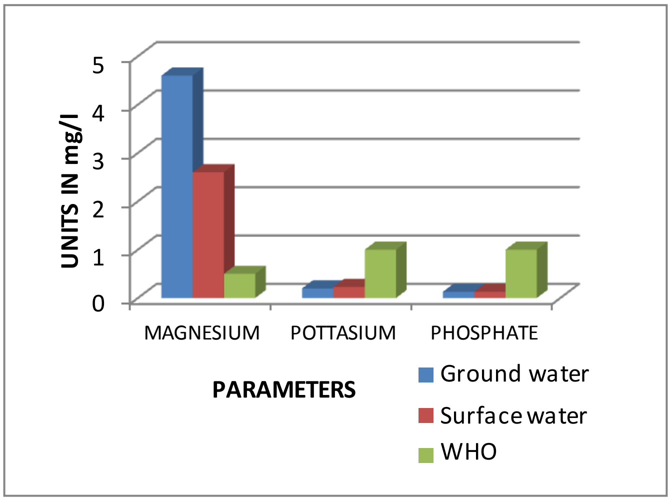

Figure 11 Chart shows comparison of water sample Magnesium, Potassium, Phosphate with WHO standard

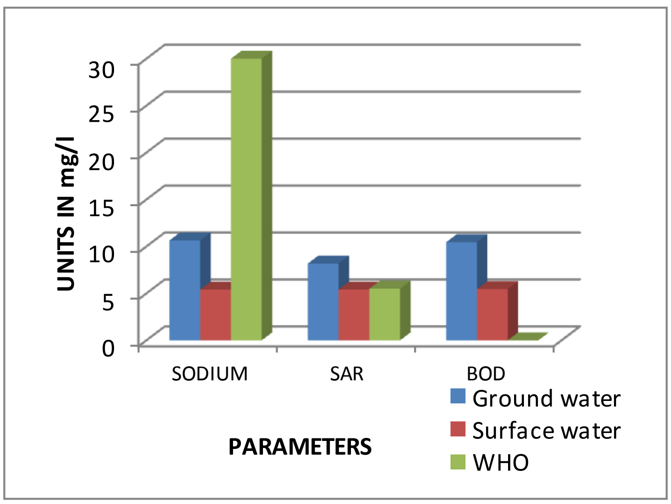

Figure 12 Chart shows comparison of water sample Sodium, SAR, BOD with WHO standards

V CONCLUSION

In our project we collected water samples from different location based on crops. The chemical contaminants that present in water sample are observed by testing. We use the inorganic fertilizer to improve the crop efficiency. But it causes the hazards to environment. Most important parameter of fertilizer like nitrate, potassium, and phosphate content in water standards are 45 mg/l , 1.0 ppm, and 1.0 ppm. The observed value of water samples nearer to standards. The below parameters are exceed the standards such as normal pH value of drinking water is 6.5 to 7.5 but sugarcane and corn samples has greater than 7.5. Magnesium value of drinking water is 0.5 mg/l but rice, sugarcane and corn water samples value exceeds the standards... The continuous use of fertilizer alone the value may chance to exceed the standard. In drinking water BOD and COD value is negligible one. The observed value of water samples is high. blood vessels problems and vitamin D deficiency. If the living organism consume the affected water that may center to in food chain. It affect the aquatic living organic system.

VI RECOMMENDATIONS

To use organic fertilizer instead of inorganic fertilizer and pesticide.

To use appropriate amount of inorganic fertilizer on land what they needed.

To create awareness to farmers regarding harm full effects that caused by using inorganic fertilizer.

To use less amount of inorganic fertilizer.

To use some filtration process to remove chemical contaminates.

To reduce the continuous use of inorganic on same land.

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