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Arsenic in Drinking Water and Its Hazardous Effects

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Abstract: *The presence of metal and metalloids like Arsenic and Selenium in potable water, domestic waste and industrial effluents is a serious problem due to their toxic properties. They affect public health to large extent waste water systems and the biological system of water bodies. The impact of traces of heavy metals in drinking water is dangerous for human health in long run. Acute Arsenic poisoning can arise from the ingestion of as little as 100 mg/l of As .Chronic effect can appear from its accumulation in the body at low intake levels for prolonged periods. The study is focused on Arsenic concentration of Pakurdist's Penum coal mines, Udalbani Stone chips mines and Dumkadanga Stone chips mines surface water Arsenic concentration and its impact on human health.*

Keywords: Arsenic, Selenium, Water, Hazardous Effects

I. INTRODUCTION

Arsenic (As)is a metalloids and is highly toxic in its inorganic form. As occurs naturally in the earth crust. Most As in drinking water comes from natural rock formation. Water containing As flows through and they dissolve Arsenic in drinking and other water underground and surface water sources. It is found in concentration about 1% in Pb-Zn concentrate use in smelters and because of its volatility. It can spread into the atmosphere as pollutant. However, the greatest source of pollution from arsenic is its used in agricultural chemical such as weedicide, fungicide, insecticide and rat poison. Arsenic occurs in air wherever coal is burn particularly near smelter and refineries. Sea water contains 2 to 5 ppm of arsenic and in public water supplies its concentration may be higher. In areas where continuous arsenical sprays are used high level can be present .Arsine (AsH_3), which is a by product of much industrial process involving arsenic, is the poisonous of all arsenical compounds. It is toxic even at dilution of 1:20, 000, cases of chronic arsine poisoning reported in workers involved in ore smelting and metal refining, leaching, soldering, galvanizing and lead plating operations. Arsine may be liberated by the action of fungi in sewage plants. Accidental arsine poisoning was reported in petroleum industry. Arsine (AsH_3) combines with hemoglobin and is oxidized to a hemolytic compound that does appear to act by sulphydryl inhibition. Low chronic doses of arsenic ingested tend to accumulate in lipid rich tissues. High arsenic in man is usually found in hair, nails and skin. When arsenic inhaled it is deposited in lungs tissues for a long time. Soluble arsenicals are absorbed from all mucous membranes. Arsenic containing ointments or soluble vesicants is absorbed through the skin. Non-allergic contact dermatitis and conjunctivitis frequently suffered by workers exposed to arsenic containing dusts. Continued inhalation of arsenic dust may causes perforation of the nasal septum, as in the case with chromium another metallic dusts. Chronic ingestion of inorganic arsenic causes peripheral arteriosclerosis, commonly known „black foot disease". It may also cause peripheral neuritis resulting in motor and sensory paralysis of nerve extremitis. Arsenic is toxic to liver and it produces fatty infiltration and cause central necrosis, cirrhosis. Arsenic poisoning also affects bone marrow and cellular elements of blood. Most human foods like vegetable, fruits, dairy products and meats contain less than 0.5 ppm and rarely exceed 1ppm of arsenic. Arsenites being more soluble in water are more phytotoxic than arsenates. The toxicity of arsenic to aquatic biota generally decreases with increasing pH of the medium due to the oxidation to arsenic toxicity whereas grapes, carrots, apple, tomato, potato and tobacco are more resistant .

Arsenic in drinking water is the greatest threat to public health .Long term exposure of inorganic As in drinking water is known to cause human health problems including cancer, thickening and discoloration of skin etc.

II. METHODS AND METHODOLOGY

All the samples are collected in plastic container doubly washed with chloroform as per the standard procedure of APHA. Samples are collected from Panem coal mines, Udalbani Stone chips mines and Dumkadanga Stone chips mines surface water from different places. Water samples are collected and tested for different parameters for domectic uses and irrigation purpose .This study is focused on the value of Arsenic and it is tested by following procedure:

Silver Diethylduthiocarbamate Method :

Inorganic As is reduced to AsH3 by Zn in acid solution in a Gutzeit generator. AsH3 is then led through a scrubber containing glass wool impregnated with $Pb(CH_3COO)_2$ solution and into absorber tube containing Ag-Diethyldithiocarbamate ($AgSCSN(C_2H_5)_2$) dissolve in pyridine. As react with this Ag -salt forming a soluble red complex which is measured at 535 nm.

Procedure:

1. Take 25-35 ml sample in a clean generator bottle (Gutzeit generator). Add successively, with thoroughly mixing after each addition ,5 ml conc. HCl ,2 ml KI (15%) solution and 0.5 ml of 40% SnCl2 reagent. Allow 15 minutes for reduction of As (v) to As (lll) .
2. Add 3 g Zn (20-30 mesh) to the solution in the generator and connect the scrubber absorber assembly immediately.
3. Allow 30 mins to complete the evolution of AsH3. Warm the generator slightly to ensure that all the AsH3 released. AsH3 passes through scrubber containing glass wool impregnated with 4-5 drops of 10% (CH3COO)2 and then to the absorber containing 4 ml of 0.05 % Ag -Diethylduthiocarbamate in pyridine for 45 minutes.
4. Pour the solution from the absorber directly into 1cm cell and measure the absorbance of the red solution at 535 nm against a reagent blank.

III. RESULT AND DISCUSSION

Value obtained for As for different samples are discussed below in pi chart and bar diagram .

Average Seasonal Arsenic for Different Samples from May 2017 to December 2018

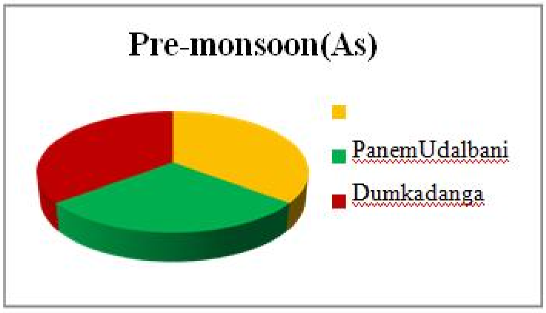


Fig -1

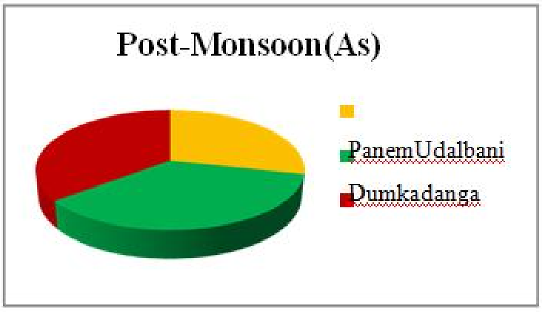
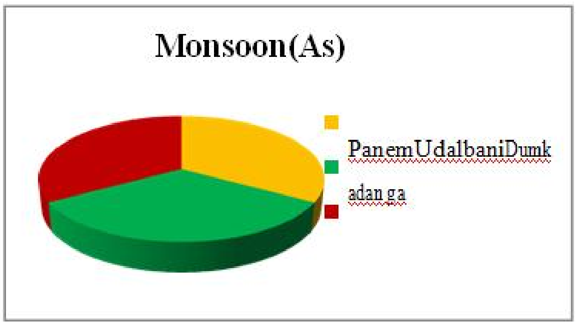


Fig - 2



Average Seasonal As(mg/Lorppm) for Different Samples from May 17 to December 18

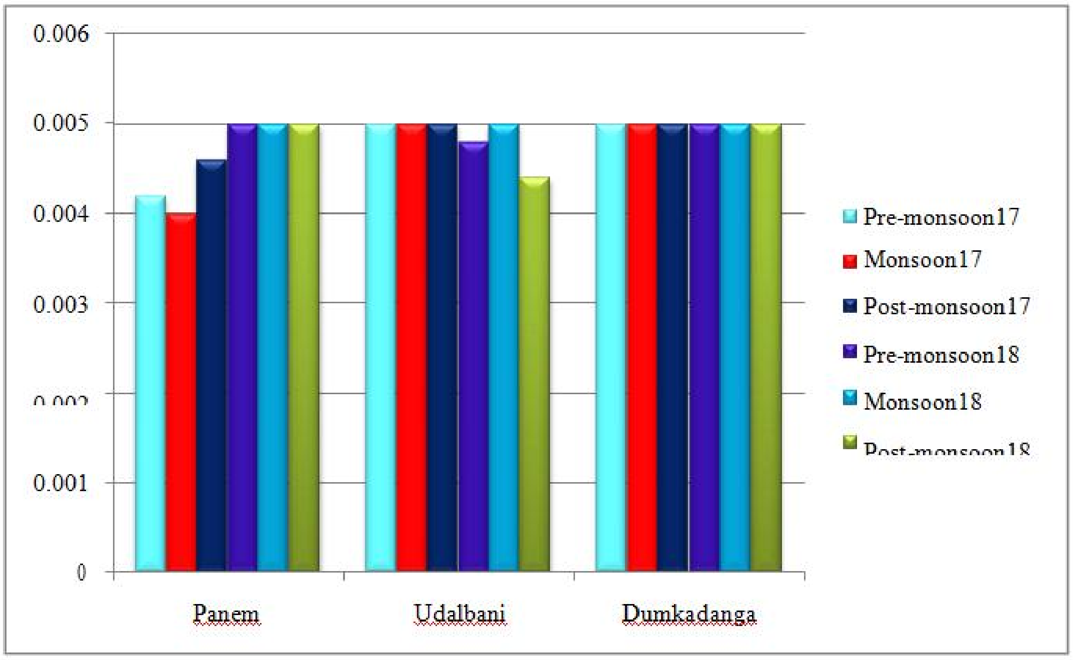


Fig - 4

From the above data it is found that the samples have arsenic value in desirable range. There is no Arsenic contamination in these water sources.

IV. CONCLUSION

As is a heavy metalloids in water . It cause many human health problem called "Arsenicosis " which cause discoloration of skin ,thickening of palm or foot , muscular pain ,weakness , tiredness and pin prick sensation of foot. In extreme condition it causes cancer and digestive problems. Arsenic has no color ,odour and taste so it is not easy to detect it in water. Only procedure for detection of As in water is laboratory test . Tube well water and other drinking water sources must be tested for As contamination time to time . As cannot be removed by boiling alternatively boiling of water increases its concentration. So there is no home treatment for removal of As from water . The most effective method for removing Arsenic from domestic water supply is reverse osmosis (RO).Some food like shellfish may contain Arsenic so avoid using these type of foods regularly . And drink purified supply or home RO water .

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