

# Analysis of heavy metals in Detergent Sample of Jhansi, India

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**Abstract:** The large amount of detergents are used everyday and dispose the effluents to the environment which release many Organic, Inorganic and Heavy metal pollutants. In this study seven detergent samples of different brands were taken which were commonly used in Jhansi, India. These Detergents samples were analysed for concentration of Iron (Fe), Copper (Cu), Mangnese (Mn), Zinc (Zn) by using Double Beam Atomic Absorption Spectrometer. The average heavy metal concentration of all the estimated metals were much lower than the permissible limits of effluent as well as drinking water except Cu concentration which exceeds the drinking water limits and may causes adverse effect on human health and environment as well.

Keywords: Detegents, Heavy Metals, Toxicity, Health Safety, Double Beam AAS.

## I.INTRODUCTION

The human health and environment safety is one of the major problem facing by whole world. Pollution cannot be eliminated from the earth because of man which uses various resources for their existence, the use of these resources ultimately generate waste. Nature has got its own mechanism of self purification in the form of various cycles but when they are in limited quantities. Here we are talking about the problem generated by Surfactants which are used everyday and everywhere. The population growth and the modernization both work synergistically to increase the use of surfactants. It has cleaning properties which helps to remove dirt and other foreign material (Longman, 1975). These Detergents are widely used for cleaning purposes like at home, Industrial premises for washing clothes, equipment, dishes, and vehicles. . The chemistry of soap manufacturing developed primarily in the year 1961 during first world war . Overtime it has changed to multifunctional products. With advancement of technology Biodegradable and green friendly products, water conservation washing machines, laundry detergents tablets were started to manufacture.

On the basis of chemical nature detergents are firmly divided as Nonionic Detergents which have no electrostatic charge on it and most commonly used for solubalization, Anionic Detergents have a negative electrostatic charge, Cationic Detergents have a positive electrostatic charge, Amphoteric or Zwitterionic Detergents are able to assume a positive or negative electrostatic charge, depending on the type of solution in which they are present. Compounds such as betadienes and alkylamino-oxides belong to this class.(Yuan et al.2014)

Detergents also categorised according to their physical nature such as, detergent powder, detergent bars, liquid detergents, dishwasher bars, dishwasher liquids etc. Modern fabric washing powder consist a number of chemical ingredients in various proportions to fulfill the demands of modern living. Most of today's detergents product will include the main ingredient Lauryl Sulfate & Sodium Lauryl Sulfate/ Sodium Lauryl Ether Sulfate (SLS/SLES) which are toxic to both for human health specially for skin and environment (Zielinski Eric, 2019). Bleaching Agent are used for brightening the clothes such as hydrogen peroxide, perchlorate, sodium hypochloride, zinc phosphatecyanine sulphonate (ZPS) etc (Zielinski Eric, 2019). Fluorescens and Optical brighteners are substance which prevents the colours of clothes basically they are stain-hiders, but these are an eye, skin, and lung irritant, extremely toxic to aquatic life (Cynthia,2018) . Sodium tripolyphosphate (STPP), have been used as builders but now-a-days banned because of phosphates to save natural waterways from eutrophication-mineral poisoning that causes high die-off of native marine animal species (Zielinski Eric, 2019). Corrosion Inhibitors is an ingredient which protect against the corrosion of appliance surface. Preservatives are a substance that protects soaps and detergents against the natural effects of aging such as decay, discoloration, oxidation and bacterial degradation which causes unusual odour to it. Builders are generally water softener in detergent which can remove calcium and Magnesium ion by complexation or precipitation in hard water, detergent generally consist of surfactants and chelating agents such as Cyclodextrine, Ethylene Diammine Succinate ( SS-EDDS), Propylene glycol, surfactants remove dirt from a solid surface and chelating agents are used to surround unwanted metal ions found in cleaning solutions. Builders have a number of functions including softening (Diethylester dimethyl ammonium chloride DEEDMAC), buffering, and emulsifying. Sodium carbonate (soda ash) is used as a builder but can only soften water through precipitation (essential industry.com). it is mostly used in high concentration in dish washing detergents( Fateh, 2017). A study was conducted regarding

heavy metals concentration in detergent in Nigeria and South New York(Sani et al.,2018), but no study is reported in India irrespective of the fact that the consumption of detergent in India rises to thousands of tones (Consumer voice, 2001).

Soaps are biodegradable when discharged into water bodies these are decompose into carbondioxide, water, bicarbonates and carbonates. But detergent contain lot of chemicals and thus causes eutrophication, 2.5-3.5% commom detergent concentration causes mortality to some fishes as well as retard the working of the water plant, also make water purification process difficult. The selected metals are well established essential nutrients, but excess intake of zinc causes renal failure. Copper present in various enzymes like tyrosinase, cytochrome oxidase, uricase but excess concentration causes gastro intestinal disorder hemolysis, hepotoxic and nephrotoxic. Mangnese is essential trace element at lower concentration because it at as a co-factor in some enzymetic reaction, its higher level gets accumulated in kidney, liver and bones causes toxicity. The foster of these chemicals into detergents run of the municipal sewage and ultimately contributes these products to the environment (Mohomed et al., 2018). The aim of this study is to determine heavy metal concentration in different sample of detergent commonly used in U.P. in India.

## MATERIAL AND METHODS

All the collected detergent samples were purchased from retail outlets and open market shops from Jhansi, U.P. in India.

### Extraction of metals:

1gm of the each sample were dried in oven at 400°C for 4 hrs, cooled the sample dissolved in 5 ml of 20% (2M) HCl and heated on water bath for 5 minutes and filtered with whatsmann filter paper in 50 ml volumetric flask and makeup to the mark. With these solutions Cu, Mn, Fe and Zn were analysed by using a chemito AA203D double beam Atomic Absorption Spectrometer with air acetylene flame. Each value of different elements were recorded at different wavelengths as 324.8 nm for Cu, 248.3nm for Fe, 213.9nm for Mn and 279.5nm for Zn (Sani et al.,2018).

## RESULTS AND DISCUSSION

Table1: concentration of heavy metals in detergent samples in mg/kg (ppm) and permissible limits of drinking water and waste water in mg/lit (ppm)

<i>Brands name/Permissible limits</i>	<i>Ghadi Maha shaktis hali wash</i>	<i>Active Wheel lemon fresh</i>	<i>Easy liquid wash gently clean and softener</i>	<i>Patanjali Anti bacterial Neem fresh Rose fragrance powder</i>	<i>Vanish oxi Action</i>	<i>Tide plus detergent</i>	<i>Permissible limits in drinking water in mg / lit ( ppm)</i>	<i>Permissible limits in waste water in mg / lit (ppm)</i>
<i>Metals</i>								
<i>Iron</i>	<i>0.001</i>	<i>0.008</i>	<i>0.006</i>	<i>0.003</i>	<i>0.001</i>	<i>0.002</i>	<i>0.3</i>	<i>1.0</i>
<i>Manganese</i>	<i>0.008</i>	<i>0.001</i>	<i>0.007</i>	<i>0.001</i>	<i>0.003</i>	<i>0.004</i>	<i>0.10</i>	<i>0.3</i>
<i>Copper</i>	<i>0.48</i>	<i>0.69</i>	<i>0.49</i>	<i>0.55</i>	<i>0.66</i>	<i>0.68</i>	<i>0.05</i>	<i>1.5</i>
<i>Zinc</i>	<i>0.001</i>	<i>0.004</i>	<i>0.08</i>	<i>0.003</i>	<i>0.01</i>	<i>0.007</i>	<i>5</i>	<i>15</i>

In these Samples of Detergent the observed concentration of Iron (Fe) vary from 0.001-0.008 mg/kg .On comparing the observed concentration with the permissible Limits, it shows that the concentration of Iron in all observed detergent sample is within the permissible limit of drinking water (i.e. <0.3ppm). The presence of concentration of Iron is nearly negligible in samples and does not show any adverse effect to the human life, environment, as well as aquatic life (Scclmines.com).

Similarly, In case of Manganese (Mn) the observed concentration in all respective samples were in the range of 0.001-0.007 mg/kg, which is within the permissible range of Indian standard. The concentration of Copper (Cu) in all observed samples were present in the range of 0.49-0.70 mg/kg which is lower than the concentration of copper was recorded in a study at South New York 1.52-1.63mg/kg (Robert,1995). On comparing the observed concentration with permissible Limits it shows that the observed values lies between 0.05 to 1.5 (ppm) means greater than permissible Limits of drinking water and below the permissible limit of waste water, which appear to be in moderate level and shows its toxicity to human as well as to environmental lives (Scclmines.com).

The concentration of Zinc (Zn) in all samples of detergents were present in the range of 0.01-0.08 mg/kg, which is much lower than the reported concentration of Zinc from 4.02-4.11 mg/kg in cleaning product at south New York (Robert,1995). The observed concentration is extremely low which do not exert any harmful effect on the skin (Robert, 1995).

## CONCLUSION

The observed heavy metal concentration of Fe, Mn and Zn were within the permissible range of effluent and drinking water both, but the concentration of Cu is within the range of waste water but exceed the drinking water range, untreated water is not safe for watering the plants. So there is a need to monitor the surfactant as well as effluent, to prevent environmental pollution.

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