

COMPARATIVE STUDY OF SEASONAL VARIATION IN PHYSICO-CHEMICAL PROPERTIES OF WATER OF RIVER KHAROON IN EFFLUENT DISCHARGE AREA OF BHILAI STEEL PLANT

ALKA MISHRA^{a1}, RINSY MATHEW^b AND SAKSHI MISHRA^c

^aDepartment of Microbiology and Zoology, Swami Shri Swaroopanand Saraswati Mahavidyalaya, Hudco, Bhilai, Chhattisgarh, India

^{bc} Department of Microbiology, Swami Shri Swaroopanand Saraswati Mahavidyalaya, Hudco, Bhilai, Chhattisgarh, India

ABSTRACT

Bhilai steel plant is an integrated steel plant situated 40km far from Raipur District, the Capital of Chhattisgarh. It manufactures Iron, coal tar, iron rod and economically important substances made by iron, along with these products it also produce Benzene coal tar and effluent (produced from the coke oven used for cooling), effluent oil, phenol, ammonia and other harmful substances. All the substances are discharged through a channel and dumped into river Kharoon, the tributary of river Shivnath located in Kumhari near Raipur. These effluents affect the soil, water and other water bodies found in the dumping site and the people live near to it, and use water for their daily activities. By this work we study the toxic impact of effluent in water of river kharoon and its seasonal variation in water. For this we measure the physico chemical properties of the water of river kharoon where the effluents mixed in river. Different parameters like as pH, temp, turbidity, DO, BOD, phenol, alkalinity, acidity, TDS, TSS, and TS were calculated by APHA-AWWA method 1985 and comparative study were done through different statistical methods.

KEYWORDS: Bhilai Steel Plant, Effluents, Physico Chemical Property

Due to Continuous industrialization, agricultural activities and the activities of man, large amount of effluent's directly entered in water bodies, change the conditions and causes pollution. The term pollution refers to any changes in the natural quality of environment brought about by physical, chemical or biological factors (Walker 1971). Industrialization and domestic wastes, sewage and industrial effluents are generally allowed to be added to the river without any pre-treatment. When introduced into aquatic ecosystem it causes of ecological degradation and affects the living organisms found in that area & change the habitat of the organism's, (E.E. Obasohan) Due to this some are destroyed or diverted to another area for their survival because many synthetic and organic wastes are introduced into the aquatic ecosystem and depredated and cause severe adverse consequence on the aquatic biota.

Bhilai steel plant is an integrated steel plant situated 40 km far from Raipur district, the Capital of C.G. It produce Iron, Coal tar, Iron Rod and economically important substances made by Iron, along with these products it also produce Benzene Coal tar & effluent (produce from the coke oven used for cooling) effluent oil, phenol, ammonia & other harmful substance are also discharged through a channel and dumped into river Kharoon tributary of river Shivnath located in Kumhari near Raipur. This effluents affect the soil, water and other water bodies found in the dumping site

and the people living near by use this water for their daily needs.

Several investigations have been carried out on the effects of pollution in aquatic ecosystem. Victor and Tettech 1988 and Oguzie 2003 reported a reduction in fish species diversity associated with the introduction of municipal wastes and industrial effluents into Ikpoda river. Idodo-Umesh (2002) also reported similar reduction in fish diversity in Olomora water bodies to effluents from petroleum refining activities. Other investigation Fulfey in 1998, Wangbaje and Oronosaye (2001) reported heavy metal concentration in some dominant and commercial fishes in Ikpoba reservoir and Ogba rivers. Somnath Day in Durgapur barrage, Quadros et al in anthropogenically polluted Thane, Verma et al 2012 in Nandani mines Durg,

The coke oven effluent generated by the Bhilai Steel Plant too has a strong phenolic odour and contains a high amount of phenol, besides the presence of other toxic substances that the use of this wastewater causes the onset of skin rashes in humans and cattle and is primarily being used for irrigation purposes by the local villagers. After travelling an approximate distance of 15 kilometers, it is further dumped into the river Kharoon which caters to the needs of Raipur and adjoining cities. The soil texture of the embankment of the channel also appears to be oily black. Inevitably, all these factors raise questions on the toxic effects of the effluent on the aquatic life dwelling in

the river. Hence, a thorough analysis of the physico-chemical characteristics of the effluents was unavoidable.

The channel starts from its source at Puren, Bhilai 3 and after travelling an approximate distance of 15 kilometers through meadows and villages, ends up in the river Kharoon, a tributary of the river Mahanadi. This place is inaccessible, being camouflaged between trees and guarded by barbed wire and is situated in the outskirts of a small town Kumhari, about 15 kms west from Raipur city, the capital of Chhattisgarh. The waste water flowing through the channel was found to be blackish-brown in color with floating oil and intense phenolic odor. The soil texture of the embankment, particularly near the origin at Puren, appeared to be oily black. The vegetation mainly comprised of grasses.

MATERIALS AND METHODS

The entire course of the channel was traced to be travelling through the villages Sirsa, Somni, Nardhi, and Aundhi before reaching the river at Kumhari. About 100 villagers were interviewed with the help of a questionnaire to understand the effect of the effluent on the humans and animals living there and using the water for their daily chores. Accordingly, the local villagers avoided using the wastewater since it was reported to cause an itching and burning sensation in the skin accompanied by reddish papule like dermatitis.

From December 2014 to February 2016 seasonal variation in Physico chemical characteristics of effluents was studied. Collection of water samples was done at three points in Kumhari (L3) viz., from the river mouth of the effluent channel(A) and upstream(B) and downstream(C) direction in the river Kharoon. Samples were collected in plastic bottles and transported immediately to the laboratory for analysis of physicochemical analysis of water (APHA-AWWA1985). The selected parameter's are PH, Temperature, Colour, Conductivity, Turbidity, Solid, Acidity, Alkalinity, Chloride, Hardness, Sulphate, Sulphide, Nitrate, Nitrite, Iron, Phenol, DO, BOD, COD, MPN etc. After the study we find out variation in physico-chemical characters of effluent.

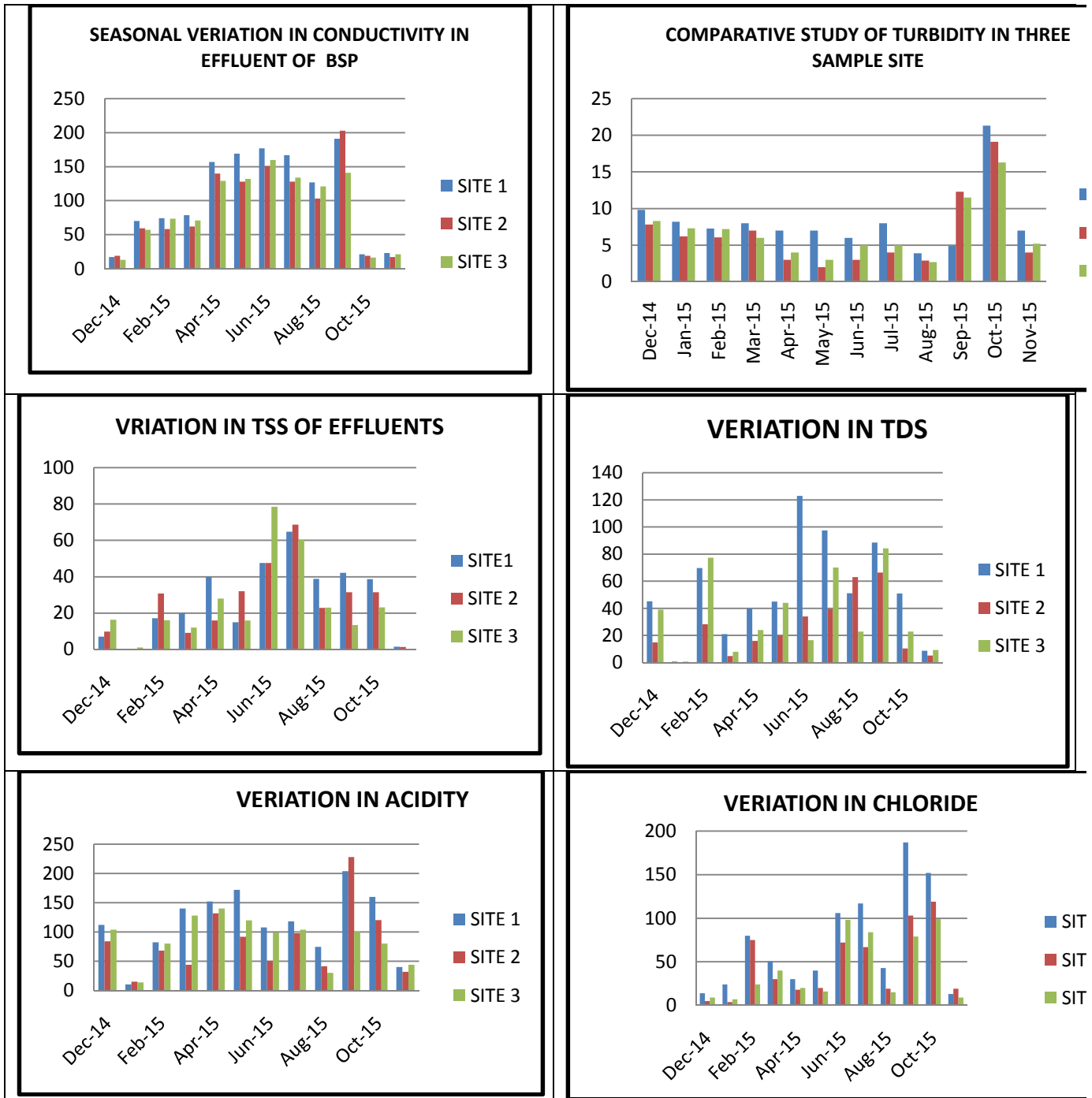
RESULTS AND DISCUSSION

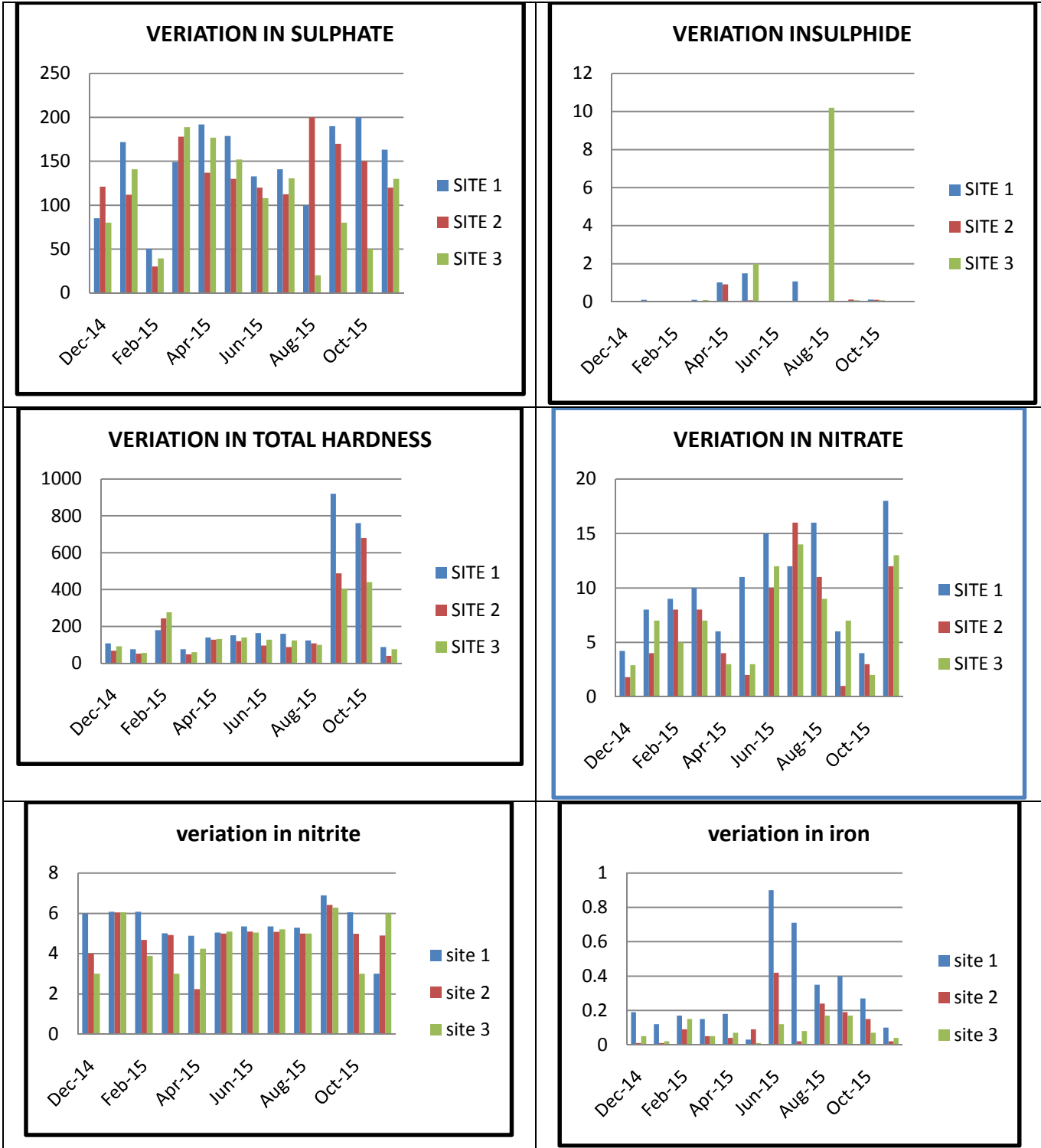
Environmental pollution is one of the most serious problems facing humanity and other life forms on our planet today. Since millions of years, natural resources had been stored virtually untouched in the Earth, but, within a period of a few hundred years, the onset of the industrial revolution led to massive exploitation of a vast amount of these resources at unimaginable rates. The result was the generation of large amounts of waste going straight in to the environment, seriously damaging its natural processes. The consequences were deleterious, giving birth to three major types of contaminations of our precious natural wealth-air, water and soil. Water, a universal solvent is an essence for life on earth. Hence, discharge of various toxic chemicals and substances into water makes life difficult. If discharged directly in to the environment without treatment, some of these pollutants are responsible for various acute and chronic diseases, such as skin burns and rashes, bone abnormalities, lung and digestive system disorders in aquatic and surrounding land fauna.

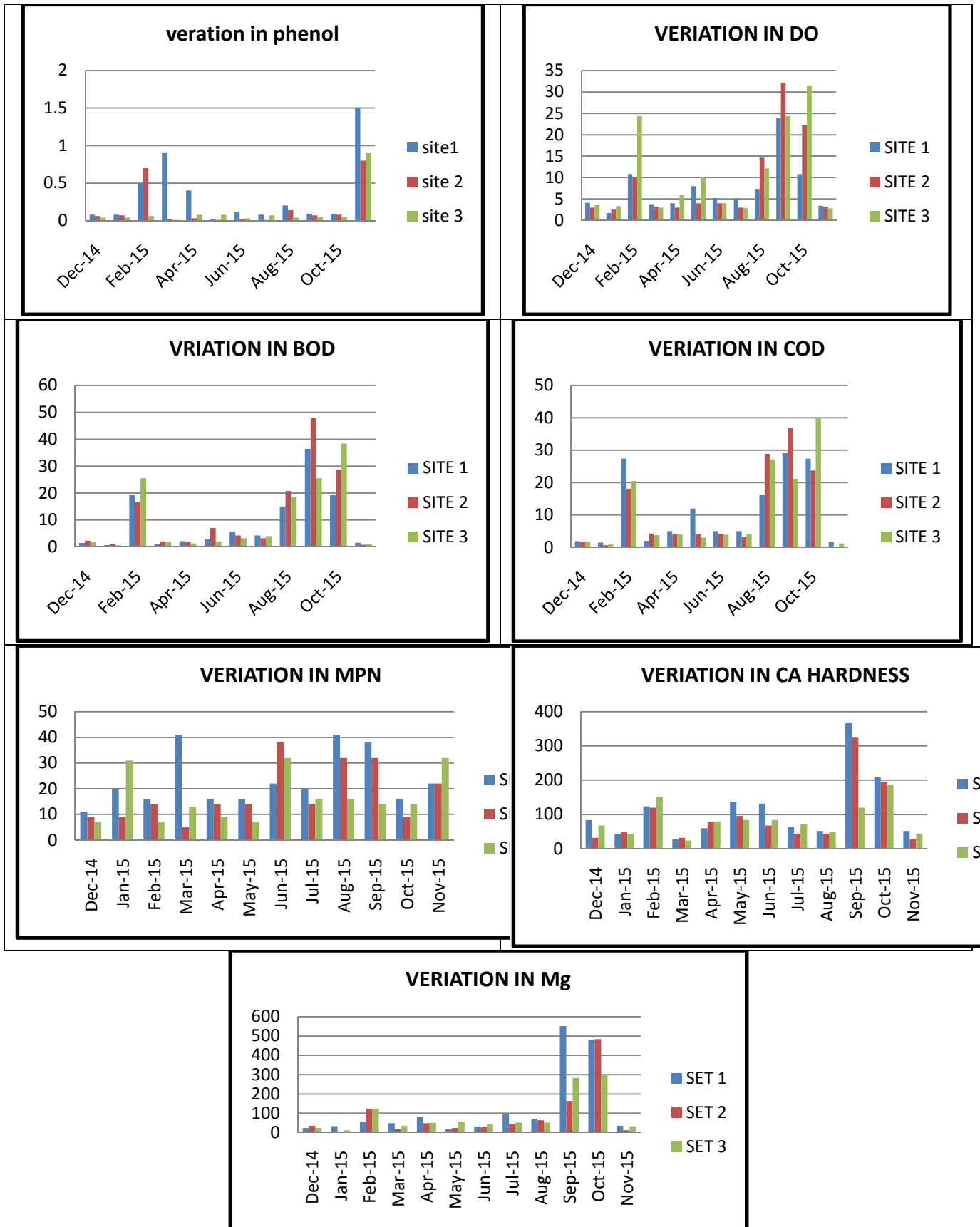
The chemistry of natural surface waters is complex and depends on the equilibrium reached with the normal physical, chemical and biological characteristics of the surrounding environment. Hence, a large amount of variation exists between normal surface water qualities from different regions. If within the natural limits, organisms including fishes living in such environments can adapt to these natural fluctuations of water quality

After the study it has been observed that pH, Temp, conductivity, turbidity, TDS, Acidity, Alkalinity, chloride, Sulphate, Hardness, Nitrate, Nitrite, Iron, Phenol, MPN, Hardness were found to be at higher than the downstream and upstream, while TSS, Do, COD was found to be higher. The study reveals that the effluent discharged site of the BSP accumulated pollutants over the years and has resulted in the decline in fish species composition in this habitat(Graph1).

Graph1: showing variation in physicochemical characteristics of effluents of Bhilai steel plant (CG)







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