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# IMPACT OF DOMESTIC WASTE WATER OF BHILAI STEEL PLANT TOWNSHIP ON MACROPHYTES LIKE *CALOCACIA* SP. AROUND THE FLOW PASSAGE

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## ABSTRACT

**In the normal condition the size and shape of the leaves, root and stem is standard. But in the contact of effluent, the size and shape of the leaf , root and stem is larger. Likewise in normal condition and effluent condition the concentration of phosphate iron, calcium and magnesium are different. In normal condition, plant height is 35 to 45cm whereas with the effluent effect, the height of the plant is 96 to 99cm long Variation in the parameter of effluents like temperature, ph, total dissolved solid, free carbon dioxide, chloride, dissolved oxygen, biological oxygen demand, chemical oxygen demand, phosphate, sulphate, nitrite, nitrate, ammonia, magnesium, calcium, iron and phenol effects the shape, size and the concentration level of the plant.**

## INTRODUCTION

Environment is the circumstances, objects or conditions by which one is surrounded or environment is the complex of physical, chemical or biotic factors that act upon an organism or an ecological community and ultimately determine its form and survival (Merriam Webster's Collegiate Dictionary,10th Edition, 1996). Industries are inevitable in present day civilization for our material comfort; however, they are invariably associated with the hazards of environmental pollution. Industrialization of India got momentum in 1950's and since then its continuous growth has increased the pollution problem of our country.

Most studies of water pollution are usually expressed with physical and chemical standards, placing the biological concepts in a subsidiary (Cairns *et al.*, 1971). Also, despite much progress in analytical chemistry, chemical monitoring systems have limitations. It depends much on the time and place of sampling and the thinking lying behind the sampling design (Cairns & Vander Shellie, 1980, Mouver *et al.*, 1985, 1990).

A polluting substance can be a solid, semisolid, liquid, gas or sub molecular particle. Pollution is the result of the action or presence of the pollutant in a part of environment where it is considered to have deleterious effect. In the selected effluent channel of Bhilai Steel Plant, domestic waste is mixed at each spot. The domestic wastes are rich in phosphate due

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to extensive use of hard and soft detergents and nitrogen have been emphasized to be two nutrients much in demand, but with lesser concentration. Defining eutrophication as the enrichment of water body owing to any and all nutritive substances (Hesler, 1947). Even small addition of small organic matter from polluted lakes has been found to stimulate bloom of algae (Srinivasan 1969).

The physico-chemical analysis indicates the status of water quality, whereas, biological study shows the impact of water quality on the organism. Hence both the studies are essential for have complete knowledge of water body.

Effects of some industrial effluents on phytoplanktons have been investigated by David and Ray (1966); Patrick (1973); Whitton (1975); Rai and Kumar (1976); Rana (1977); Prasad and Singh (1982); Ramaswamy *et al*. (1982); Reddy and Venkateswarlu (1985, 1986); Patil *et al*. (1986); Sengar and Sharma (1987) and Sudhakar and Venkateswarlu (1989) etc. Macrophytes have also been used as indicators of water quality (Hughes, 1992; Taraldsen and Norberg-King, 1990 and Varshney, 1981), to evaluate the effect of industrial pollution (Chaphekar *et al*. 1973) and to correlate with the water quality. Hargreaves *et al*. (1975) and Haslam (1978) have determined the macrophyte vegetation of water courses and coidic streams, while Crowder (1991) has studied the macrophytes in relation to acidification and metals.

**Study area and sites**

Bhilai steel Plant (BSP), Bhilai is situated in District Durg, Chhattisgarh (Fig. 1). The steel plant was started in the year 1959. It is the largest integrated steel plant in our country with an annual production capacity of about 4 million tonnes (Sekhar, 1988). Bhilai is situated 32 Kilometers away from Raipur city on its west on G.E.

The channel one (Samodha Nala) was taken for present research work. The colour of the effluent of the channel was dark brown throughout the year. It is very common, also, to observe bathing of people and cattle washing, in this effluent water, without any complaints or ill effects.

The soil on the two sides of effluent channel is either Bhata Soil or a vertisol, which is locally called Kanhar soil. Kanhar is a black soil. The distance of this effluent journey is approximately 16 km from Bhilai Steel Plant to Sheonath River. For effluent sample collection, 9 spots along the effluent channel were selected.

## MATERIALS AND METHODS

**Collection of Effluent Samples**

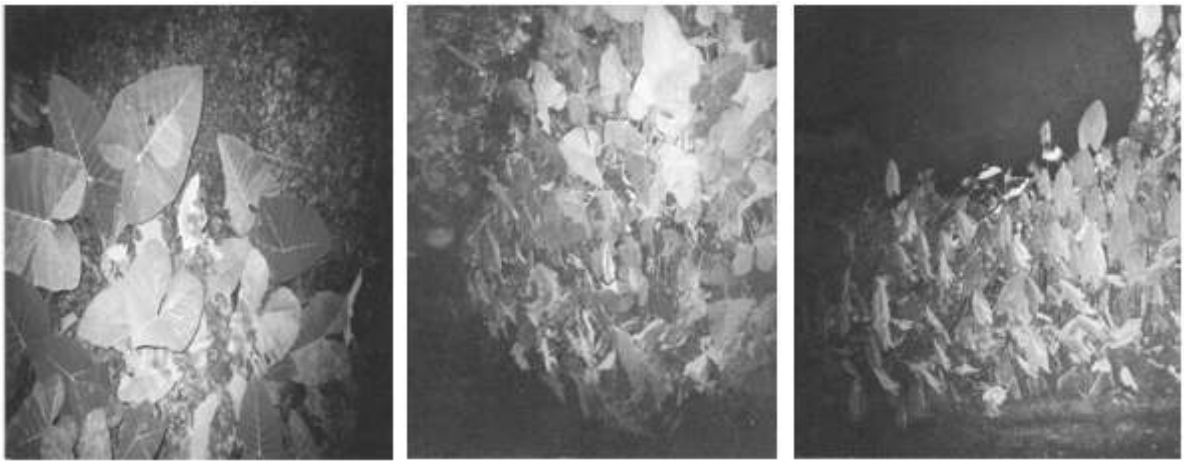
Wastewater (effluent) samples from Bhilai Steel plant was collected in plastic cans, from the sites mentioned earlier under study area and sites. Samples for dissolved oxygen determination was collected in BOD bottles. Analysis for physico-chemical characteristics of the samples was started immediately after reaching to the laboratory.

**Analysis for Physico-Chemical Parameters**

The analysis for physico-chemical characteristics of

***Colocasica* Sp. affected by effluents**

At Sector-6 At Sector-4 At Kosanala



effluent was carried out at the sampling site as well as in the laboratory. Parameters like temperature, pH, total dissolved solids, dissolved oxygen, alkalinity, was determined at the time of sampling while analysis for remaining parameters was continued in the laboratory within about 30 minutes of samplings in appropriately preserved samples. Preservation of samples was made as prescribed in Standard Methods (APHA-AWWA-WPCF 1975).

**Effect of effluent on plant growth**

Effect of collected water effluent sample from domestic waste water channel of Bhilai Steel Plant Township, studied were done on macrophytes like *Calocacia* sp.

## RESULTS AND DISCUSSION

The range mean value of Physico- chemical characters for the soil near effluent are given in Table.

| Parameters | Range | Mean |
|---|---|---|
| Temperature | 24.3-35.2 | 27.7 |
| pH | 6.49-8.65 | 7.98 |
| Total Dissolved Solids | 205-493 | 358 |
| Dissolved Oxygen | 2.5-3.77 | 1.23 |
| Total alkalinity | 20-29 | 22 |
| Free carbon-di-oxide | 0.8-46.6 | 12.67 |
| Chloride | 33.33-70 | 52.15 |
| Biological Oxygen Demand | Nil-3.77 | 0.88 |
| Chemical Oxygen Demand | 110-122.5 | 6.5 |
| Phosphate | 0.55-5.8 | 1.14 |
| Sulphate | 1312-6273 | 4506 |
| Nitrate- Nitrogen | 1010-6871 | 2905 |
| Nitrite- Nitrogen | 282-28.13 | 9.42 |
| Ammonia- Nitrogen | 2014-11225 | 6525 |
| Magnesium | 43-207 | 99 |
| Calcium | 33.27-527 | 163 |
| Iron | 440-27173 | 5360 |
| Phenol | Nil-160.5 | 47.40 |

These effluents had adverse effect on the soil near the effluent channel and different plants. Chulter (1971) Schorder (1991) also had investigated the effect of effluent on plants.

In spot no. 1 & 2, the effluent colour is dark brown. Here cobalt, copper, lead, nickel, zinc, cadmium and magnesium are present in the form of sulphate, phosphate, chloride, carbonate, nitrate and nitrites etc in high concentration. So the plant *Calocacia* sp.L. present near the effluent channel showed a drastic change in its height. The height increased from 45 cm to 96 cm. In the leaves of the plant concentration of chlorophyll a, b, total chlorophyll and magnesium increased.

When we moved downstream the effluent channel dilution of effluent took place by the addition of domestic wastes. So the concentration of heavy metals decreased. The size of the plants was larger at the places where the concentration of heavy metals were high. Presently effluent from Bhilai Steel Plant and mixture of domestic waste water has noticeable effect on different plants. Thus, if a little more care is taken to treat the waste water, it can be used for irrigation of vegetation surrounding the channel very safely.

Due to presence of heavy metal in the soil near the effluent channel, plant showed high concentration of Phosphate in stem, Iron in root and Magnesium in leaf.

In the presence of these heavy metals *Calocacia* sp. showed a drastic change in its size and behaved like a bio-indicator. When we moved downstream the effluent channel, dilution of effluent took place by the addition of domestic waste. So the concentration of the heavy metal decreased. The size of the plant was larger at the places where the concentration of heavy metals was high. Presently effluent from Bhilai Steel plant has noticeable effect on different plants. Thus, if a little more care is taken to treat effluent, it can be used for irrigation of vegetation surrounding the studied effluent channel very safely.

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