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Industrial Effluents Global Challenge To Ecosystem: A Review

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INTRODUCTION

Environment refers to immediate surrounding which supports life and sustain various human activities. The surroundings comprise of living and non-living components. Living components of environment is called biotic environment and consists of all the plants, animals and micro-organisms. Non-living components of environment is called abiotic or physical environment. It includes Land, Water, and Air.

A polluting substance can be a solid, semi solid, liquid, gas or sub-molecular particle, A polluting effect may be some kind of waste energy such as heat, noise or radiation. No substance or form of energy is automatically a pollutant as this depends upon its effects which in turn depends on where the environment it has been liberated.

GLOBAL CHALLENGES A REVIEW

Environmental Pollution is one of the major problems of the world and it is increasing day by day due to urbanization and industrialization. Over the last few decades large scale usage of chemicals in various human activities has grown very fast, particularly in our country which gone rapid change in industrialization in order to sustain over growing large problem of population (Mustafa et al, 2010).

The current pattern of industrialization alters the natural flow of materials and introduces novel chemicals into the environment. The released organic compounds and heavy metals are one of the key factors that exert negative influences on man and environment causing toxicity to plants and other forms of biotic and abiotic that are continually exposed to potentially toxic heavy metals (Chandra et al, 2010).

Industrial effluents containing heavy metals pose a threat to the ecosystem. These metals are present in the wastewater of different industries such as metal cleaning, plating baths, refineries, mining, electroplating, paper and pulp paint, textile and tanneries (Mistry et al, 2010).

Water used in these industries creates a waste that has potential hazards for our environment because of the introduction of various contaminants such as heavy metals into soil and water resources (Prabavathy and De, 2010). The entry of the organic and inorganic form of contaminants results from disposal of industrial effluents (Gowd et al, 2010).

Presence of pollutants in effluent is a common environmental hazard since the toxic metal ions dissolved can ultimately reach the top of the food chain and becomes a risk factor for human beings (Devi and Sasikala, 2010).

Soil as a natural body originated from its ability to produce and sustain crops. In view of the heterogeneity and complexity of the soil system. According to (Biswas and Mukherjee, 1995)12 the soil is a dynamic natural body developed as a result of pedogenic processing during and after weathering of rock. Soil is the most important component of the environment, but it is the most undervalued, misused and abused one of the earth's resources (Gokulakrishnan and Balamurugan, 2010). Soil contamination has become a serious problem in all industrialized areas of the country. Soil is regarded as the ultimate sink for the pollutants discharged into the environment (Shokoohi et al, 2009). The source of the organic and inorganic elements of the soil of contaminated area was mainly from unmindful release of untreated effluent on the ground (Shetty and Raj Kumar, 2009).The contamination of soil with heavy metals or micronutrients in phytotoxic concentrations generates adverse affects not only in plants but also poses risks to human health (Murugesan et al, 2008).

CONCLUSION

Increasing demand of Agro based industrial effluents from different industries leads to inappropriate dumping of solid and liquid wastes ,causes in the detioration of ground water quality (Ogunfowokan and Fakankun,1998;Gupta and Gupta 1999; Bhabindra 2003;Sandeep and Sweta 2008and Mahananda et al.,2010).

Effluents containing some trace metals which are harmful for human beings and animals (Gupta and Gupta 1998) and soil micro-organisms which are responsible for the maintenance of soil fertility. Industrial wastes should be properly treated before being dispose off to ground and for irrigation purposes.

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Effect of Industrial Effluents on Cereal Crops Special Reference to Triticum Aestivum : A Review

Sarwat F. Usmani, Renu Sharma and Jamal A. Khan

Abstract

Growing industrial establishments without proper attention on pollution control measures have resulted in adverse impact on wheat production due to use of industrial effluents as irrigated water. The objective of the review is to analyze the impact of different industrial effluents on wheat crop and to gather information regarding the beneficial part of industrial effluent after proper treatment.

INTRODUCTION :

Increase in population results in an increase in food demands that leads to increase in food production and production to fulfill the needs of products. Various industries are there disposing off industrial effluents into soil and water bodies causing major pollution problem. The water pollution is a result of addition of large amount of toxic materials (Terry, 1996). The major causes of water pollution are industrial effluents like Tannery, Paper, Dye, Textile, Thermal Power Plants etc. They all contain specific and readily identifiable chemical compounds (Bernard and Wright, 1998). It leads to chemical transformation in soils continuously irrigated by polluted water (Faisal and Husnain, 2004).

A Review : Wheat Plant irrigated by industrial effluent -

(1) **Kalaiselvi.** ***et. al (2010)*** a review of impact of industrial effluents in seed invigoration concluded with the fact that these could be well utilized for the betterment of agriculture crops on proper dilution to evade the lethality of the pollutants. This diluted effluent could be used both for invigorating the seed and for further irrigating the crop or the nursery in case of tree seeds, depending upon the availability of the effluent specific to site as the case may be, for betterment of mankind without causing ill effect.

(2) **Singh,** ***et al*****, 2007** Soaked the Cv. Kalyansona after surface sterilization in different effluent concentrations from simple tannery effluent and shown that up to 5% concentration, germination treatment had stimulating effect, while more raise in concentration of the effluent, a matching reduce in germination per cent occurred due to reduction of dissolved oxygen, both by chemical and biological oxidation of sulphur and organic compounds. They also reported that absorption of higher dissolved solids by the seed also could have affected the germination.

(3) **Reshu (2005)** the study showed the effect of air pollution on road side wheat crop particularly through automobile exhausts discharged by high traffic density on the main Bhagwanpur road of Saharanpur. The results show great variation in the development and number of spiklets in wheat plants present at 20 m distance away from road side as compared to crop present at 200 m distance away from road side.

(4) **Kaushik** ***et al (2005)*** conducted a laboratory experiments to study the effect of textile effluents at different concentrations in the range of 1-100% (untreated and treated) on seed germination (%), delay index (DI), plant shoot and root length, plant biomass, chlorophyll content and carotenoid of three different cultivators of wheat. The textile effluent did not show any inhibitory effect on seed germination and other plant characters at low concentration (6.25%). Seed germinated in undiluted effluents did not survive for longer period. Based on the tolerance of textile effluent. the wheat cultivators have been arranged in the following order PBW-343 < PBW-373<WH-147. It has also been concluded that the effect of the textile effluent is cultivator specific and due care should be taken before using the textile effluent for irrigation purpose.

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Effect of polish industrial effluent on the mobility of amino acids using soil as transition phase

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ABSTRACT

The paper describes the mobility of some polar and non-polar amino acids in terms of Rf values by using soil thin layer chromatography follows the order Alanine > Leucine > Methionine > glycine > lysine after experimental work in which polish industrial effluent has been used as a mobile phase. In all the amino acid the mobility of amino acid increases with increasing the concentration of mobile phase. Lysine shows the lowest mobility among all. The results have been explained on the basis of a reaction mechanism involved in the interaction of amino acids with polish industrial effluent.

1. Introduction

Amino acids constitute a very important group of organic compounds with the general formula, R-$CH(NH_2)COOH$ except proline. Amino acids plays a vital role in biochemical processes (Theng 1974). Their utility in soil is known worldwide. Amino acids exist in soils from the decomposition of proteins and other soil organic matters (Waksman et al., 1932, Waksman et al., 1924). They can be adsorbed on clay forming clay amino acid complexes (Talibuddin 1955). The use of fertilizers and pesticides affects the mobility of amino acid in soil (Khan et al., 1986). The mobilities of amino acids are affected by the pH, particle size and types of soils. Their products such as indoles act as growth promoting substances and hormones in plants. Amino acids can exist as cations, zwitterions or anions depending upon the pH of the solution. This property enables them to be absorbed or undergo exchange with metallic ions on soil and clay surfaces. In view of the significant relationship of amino acids, soil, pH, particle size, the present study has been conducted to investigate the mechanisms involved in the mobilization of certain amino acids through polish industrial effluent.Many studies are reported (Ahmad et al 2003,2006.2009,2011) on different industrial effluent.Our study is based on Polish Industrial effluent is role on the mobility of amino acids using soil as transition phase

2. Material and Methods

The study was conducted on the illitic fine sandy loam collected from Agricultural fine sandy loam collected from Agricultural Farm of Aligarh Muslim University, situated in Aligarh district, India. The physiochemical properties of soil (Jackson 1958) were sand 63%, silt 24% and clay 13%, pH

8.5 (1:2.5 soil water ration), CEC, 16.3 meq 100^{-1} g soil; organic matter, 0.41%; Exchangeable Na^+, 1.0; K^+, 0.5; Ca^{2+}, 3.5 and Mg^{2+}, 1.2 meq 100^{-1} soil; available NH_4^+-N, 32.0; NO_2^- - N, 6.0; NO_3^- - N, 40.0; P, 25.0 and K, 76.0 meq-kg soil. The physiochemical properties of polish industrial effluent were pH 5.5, TSS, 500 ppm, CO_3 meq/L 1.3; Ca^+ Mg meq/L 15.2; Cr 1.14, Pb 0.05, Ni 0.30, Zn 0.15, Cd 0.014, Cu 0.28 meq g^{-1} soil.

2.1 Soil thin layer chromatography

Slurry of soil is prepared in distilled water with soil in ratio of 1:2 in each case and applied on glass plates (20 x 5 cm) with the help of an applicator in order to get a uniform layer of 0.5 mm thickness. The plates were then air dried at room temperature 30±3°C. Two lines were scribed at 4 and 14 cm from the base at the surface of all plates. An aqueous solution of 10 □L amino acids (0.05 M) was spotted at the base line with the help of micropipette. These spotted plates were developed in a closed chamber using polish industrial effluent with different concentration of 0, 2, 4, 6, 8 and 10 mL as the mobile phase to a distance of 10 cm (Helling & Turner (1968); Singhal et al. (1978). The plates were then air dried And the amino acids were detected by spraying a solution of 0.2% ninhydrin in ethanol (w/v), heated in an oven at 70-80°C for 10-15 minutes that gives a pink coloured spot. The mobility in terms of Rf values was calculated by the formula.

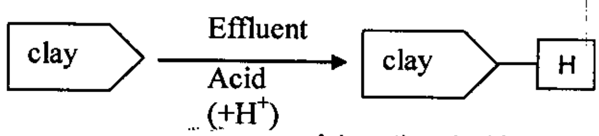
$$R_f = \frac{\text{Distance moved by amino acid}}{\text{Distance moved by solvent}} = \frac{x}{10}$$

3. Results and Discussion

The order of mobility of amino acids at natural soil follows the order: Alanine > Leucine > Methionine > Glycine > Lysine. This may be due to their increasing molecular weights except glycine.

The lower mobility of glycine than Alanine, Leucine and Methionine might be due to its polar nature which helps to adsorb over soil with the greater rate of decreasing mobility.

Table 2 shows the increasing rate of mobility with increase in concentration of polish industrial effluent (I.E). It is probably due to the acidic nature of the effluent (pH 5.5) which releases H^+ ion and block the absorptive site of clay and enhances the mobility of amino acids. It can be shown by the equation



Adsorptive site blocked

Table 1. Structure and characteristics of amino acids

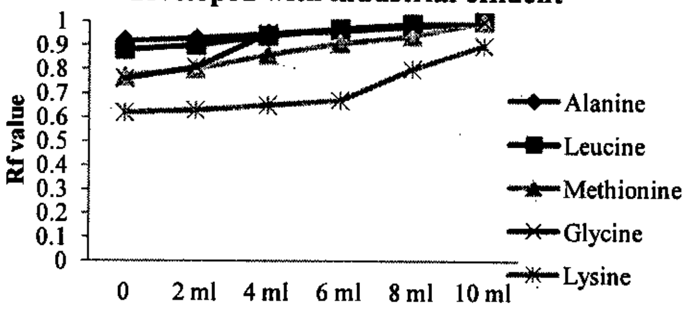
Amino acids	Molecular weight	Structure	Solubility (g 100^{-1} mL water)	Nature
Alanine	89.09	$CH_3-C(NH_2)(H)-COOH$	16.65	Neutral non polar, hydrophobic
Leucine	131.17	$(CH_3)_2CH-CH_2-C(NH_2)(H)-COOH$	2.426	Non polar hydrophobic
Methionine	149.21	$H_3C-S-CH_2-CH_2-C(NH_2)(H)-COOH$	3.381	Non polar
Glycine	75.07	$H-C(NH_2)(H)-COOH$	24.99	Polar but unchanged
Lysine	146.19	$H_2N-(CH_2)_3-C(NH_2)(H)-COOH$	Very soluble	Positively charged

Table 2. R_f values

Amino acids	D.W.+I.E. 10 mL+0	D.W.+I.E. 8 mL+2mL	D.W.+I.E. 6 mL+ 4mL	D.W.+I.E. 4mL +6mL	D.W.+I.E. 2mL +8mL	D.W.+I.E. 0 mL+ 10mL
pH	7.2	6.5	6.4	5.8	5.8	5.5
Alanine	0.92	0.93	0.95	0.96	0.98	1.0
Leucine	0.88	0.90	0.94	0.97	0.99	1.0
Methionine	0.77	0.80	0.86	0.91	0.94	1.0
Glycine	0.76	0.81	0.95	0.96	0.98	1.0
Lysine	0.62	0.63	0.65	0.67	0.8	0.9

I.E = Industrial Effluent, D.W.= Distilled water

Fig. 1. Mobility of Amino acids on soil developed with industrial effluent



4. Conclusion

The acidic nature of industrial effluent released the H^+ ions which resulted in enhanced mobility of amino acids due to the blockage of adsorption site of clay by H+ ions. Further, the increase in pH makes the molecule more adsorptive over negative charged sites of the soil colloids with strong electrostatic force resulting in its decreased mobility.

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