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REVIEW ON THE EFFECT OF CHROMIUM AND NICKEL PLATING INDUSTRY EFFLUENTS ON SEED GERMINATION OF SOME LEGUMINOUS CROP PLANTS

CHANDRA SHEKHAR SINGH[a1] AND UMAKANT SHARMA[b]

[a]Department of Botany, R.R. P.G. College Amethi, Uttar Pradesh, India
[b]Department of Bio-Chemistry R.R. P.G. College Amethi, Uttar Pradesh, India

ABSTRACT

In the present study, effect of different sites of nickel plating industry effluents on germination of seeds *Cicer arietinum* cv.G-130 and *Cicer arietinum* cv. H-208 were studied. Site-1 is the discharge point of effluents, sete-2 was 100 meter away from the discharge point and site-3 was about 200 meter away from the discharge point. Site has more concentration of nickel as compared to site-2 and site-3. The maximum inhibition of seed germination was found in site-1 treated seeds, whereas it was minimum in site -3 treated seeds. In addition it was observed that among two cultivars of *Cicer arietinum* cv. H-208 is more susceptible against nickel plating effluents toxicity in comparison to cv. G-130. In this way differential responses are shown by above state genotypes of *Cicer arietinum* towards nickel plating effluents toxicity.

KEYWORDS: Nickel, Chromium, Industrial Effluents, *Cicer arietinum*, Genotype.

Chromium and Nickel widely used in electroplating to manufacture imitation, ornaments, parts of automobiles, oven and several articles of domestic and commercial . Excessive use of above indicated heavy metals for electroplating has caused pollution of soil and water. There occurs uptake of these heavy metals by the plants. Through the food chain Cr and Ni reaches into human body.

These metals are non biodegradable so remains in the human body and causes several diseases by damaging enzymatic reactions. Most of our minerals resources are obtained from the earth crusts which are composed of many different elements. Their distribution along the lithosphere is not uniform. The minerals deposit in the earth in some regions may be relatively rich and others poor. No single region is self- sufficient in all critical resources. For example North America is rich in Molybdenum but poor in tin and Manganese. Asia is rich in Tin Tungsten and Manganese. Africa is poor in Tungsten but has most of world chromium and gold deposits. India in particular has adequate reserves of aluminum copper and Iron ores but has inadequate reserves of silver Lead and Zinc. Thus these metallic elements some of which are the concern in terms of environmental pollution are present in rocks, Soil water and air in small amounts from natural geological sources.

Some 65 of the known elements are metallic in character. The terms metal designates an element that is a good conductor of electricity, Whose electrical resistance is electrical resistance is directly proportional to absolute Non- metals are not good conductors of electricity. In addition metals share, some distinctive characteristics such as high thermal conductivity, high density malleability and ductility. It is mainly for these characters that the metals find use in the human environment. A recent estimate shows that 0.5,20,240,250 and 310 million tons of cadmium Nickel, Lead, Zinc and copper have so for been mined and wasted ultimately in the biosphere.

Metals may be essential or non- essential to the well-being of plants animals or human beings depending on their requirement for plants animals or human beings depending on their requirement for the normal metabolic functioning. Typically an element is essential.

a- It is present in all healthy living tissues within a zoological or a botanical family, in concentrations that do not very by a wide range amongst various species

b- Deficiency symptoms are noted with depletion that disappears on replenishment of the element in question to the tissues.

The trace metals considered essential for the normal growth and development of plants and human beings. Metals which may not yet be identified as serving a biological function are referred to as non-essential. The toxicity of essential trace elements follow the general trend that an under supply leads to their deficiency. A sufficient supply results in optimum conditions but an oversupply produces toxic effects and might be lethal eventually to the organisms.

[1]**Corresponding author**

MATERIALS AND METHODS

To study the effect of Chromium and Nickel plating effluents on the physiology of germination and growth of some leguminous crop plants, the seeds of test plants (*Cajanus cajan, Pisum sativum* and *Cicer arientnum* cvs.) were selected the criteria for selection was based on size shape and color. Uniformly selected seeds of test plants were sterilized by 1.1% Mercuric Chloride (HgCl2). For this seeds were soaked in HgCL2 for 5 minutes and thoroughly washed with double distilled water.

The Cr and Ni plating factory effluents were select from Basahi Varanasi. The effluents of above plating industries were collected from three sites (Site-1, Site-2 & Site-3). The factory effluent which was collected from the discharged point was site-1 the factory effluent collected from 50 meter away from the discharged point was site-2 and the factory effluent collected from 100 meter away from the discharged point was site-3

Seeds of test plant were treated in the effluents collected from site-1, Site-2, and Site-3 Separately for germination and seedling growth studies. To assess the impact of above effluents on the physiology of germination and growth of the leguminous crop plant four types of treatments where given

1- Pre radicle emergence treatment of effluents
2- Post radicle emergence treatment of effluents
3- Phasic treatment of effluents
4- Soil amendment soil amendment treatment

SEED GERMINATION STUDIES

For germination studies seeds were selected for uniformity of size color and weight surface was sterilized with 0.1% mercuric size, color and weight, surface was sterilized with 0.1% mercuric chloride solution, Thoroughly washed with distilled water and soaked in solution of factory effluents of three sites (Site-1, Site-2 & Site-3)

Site-1- Effluent collected from the discharged point

Site-2- Effluent collected from the 50 meter way from the discharged point.

Site-3- Effluent collected from the 100 meter away from the discharged point

GENERAL STUDY OF THE EFFLUENTS OF CHROMIUM & NICKEL PLATING INDUSTRIES

Basahi is also called Mirapur Basahi. It is a partly developed colony of Varanasi, town situated at the north of Bhojubeer as well as UP college, Varanasi. These is a plant for Nickel and Chromium plating. Which is used as ornaments leather tanning, explosives. Ceramics, Paints pigments photography and wood preservation.

The plant has big chamber with several rods dipped in Ni solution or cr. Solution. Plants is electrically operated. $NISO_4$, $6H_2O$ or $CrNO_3$ is used for plating, after plating effluents is discharged effluents are collected from Site-1, Site-2, and Site-3 which have been described earlier.

Waste discharged from this industrial units can be a source of water pollution by soluble Nickel and chromate salts. At discharged point Site-1 there was no vegetation at Site-2 there was some vegetation of *Polygonium remex, Solanum nigrum* and *Achyranthus* etc.

Near Site-3 there was normal vegetation but in greater n umber away from site-3 effluents which has not disturbed the natural vegetation. Some grasses were also reported near the shore of stream which was also accumulators of Ni and Cr.

RESULTS AND DISCUSSION

The present investigation was undertaken to assess the impact of three sites (Site-1, Site-2, and Site-3) of Chromium and Nickel plating effluents separately on seed germination and seedling growth studies. Based on dose response curve, obtained from studies, one promontory and an inhibitory sites of chromium and Nickel containing effluents were selected. Investigations on the effects of these three sites of Cr and Ni plating effluents on growth and yield of test plants on nodulation were also undertaken. The lines of investigations are given below.

1. Effect of pretreatment of Chromium and Nickel plating effluents separately on germinations and seedling growth.
2. Effect of post radicle emergence treatment of Chromium & Nickel plating effluents separately on seedling growth.
3. Effect of phasic treatment of Chromium and Nickel plating effluents separately on seedling growth.

4. Effect of Chromium and Nickel containing effluents amended soil separately on growth and yield.

The investigations were carried out on the above indicated lines have given the following major information.

1. Pretreatment as well as Post radical emergence treatment with three sites of chromium and Nickel plating effluents (Site-1, Site-2, and Site-3) are inhibitory for seed germination and seedling growth, with maximum inhibition in the Site-1 treated set and Site-3 treated set of above effluents showed promontory effect for seed germination. Distinct genotype (cultivar) specific and organ specific differences also exist.
2. Studies on phasic pretreatment of seeds indicate that chromium and Nickel plating effluents cause inhibition in all the phases but it is maximum in the mid phase. Maximum inhibition of seed germination and seedling growth was in mid phase treated sets. This interesting finding needs further in depth investigation.
3. Growth and yield of test crop plants grown on chromium and Nickel plating effluents amended soil i.e. Site-1 and Site-3 treated set (200 ml/kg. soil) showed inhibitory and pramotery effect respectively, however in some experiments the effect of above state Site-3 treated set is inhibitory difference is insignificant differences species specific cultivar (Genotype specific and organ specific differences exist. It has been observed that chromium and Nickel plating effluents amended) soil (site-1 treated set) is inhibitory for nodulation and growth of N2 fixing Endosymbiotic bacteria.
4. However, Chromium effluent is more inhibitory than Nickel effluents.

Our findings, on impact of chromium plating effluents on physiological studies of plants, reveal that effluents starts to exist its impact from very beginning of plant life i.e. Seed germination, seedling growth, development performance and yield. For investigation of physiological studies of certain leguminous crop plants, we have used chromium containing effluents and Nickel containing effluents, it has been shown by Kim *et al.* (1978) that higher concentration of chromium has toxic effect on rice plant. Our investigation resembles the investigation of Kim *et al.*, 1978.

Our observations on seed germination and seedling growth indicate that chromium plating effluent is inhibitory to seed germination and seedling growth, with maximum inhibition in Site-1 treated set. These observations are comparable with the earlier ones, Singh and Singh, 1996.

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