Phytoremediation of chromium contaminated soil by *Gossypium hirsutum* plant

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ABSTRACT

Industrial waste is one f the important sources of contamination in the surface environment. the plants animals and humans due to the unabated of toxic effects. Bioremediation is the microbial clean up approach. Metal polluted contaminated soil. Present study deals with chromium remove polluted soil. Chromium contaminated soil by *Gossypium hirsutum* plant. Various concentration of Chromium (control ,,10,,20,30,40,100 $mgkg^{-1}$ soil were prepared and use pot culture studies. It is evident that the increase in the chromium Concentrations increase c all effected (root length, root and shoot fresh weight, dry weight. total numbers of leaves of *Gossypium hirsutum* plants often grows slowly and have low biomass and yield. The chromium content biomass of *Gossypium hirsutum* plant up to 100 (mgkg-1) when compared with control plant.

Key words: Gossypium hirsutum. Chromium.

INTRODUCTION

World population is increasing day by day on an alarming situation in which urbanization, industrialization, weathering of rocks, mineralization have added massive amount of waste water into the soil. This situation is not decreasing but increasing heavily which deteriorates the environment. The released air is also dangerous for environment as it causes addition of heavy metals to the environment.

Environmental pollution by metals became extensive as mining and industrial activities increased in the late 19th and early 20th century. The current worldwide mine production of Cu, Cr, Cd, Pb and Hg is considerable.[1] These pollutants ultimately derived from a growing number of diverse anthropogenic sources such as industrial runoff, sewage treatment plants, urban runoff, agricultural fungicide runoff, domestic garbage dumps and mining operations. Particularly, the industrial effluents contain a wide variety of organic and inorganic pollutants with heavy metals which create many serious physiological disorders in living organisms.[2] So, heavy metals are present in the polluted soil, water and air which cause their addition into the plants. Heavy metals are harmful to plants as well as humans. In humans, they cause the problems of bones, kidneys, liver, and nerves. In plants, we are well-known to disorders caused by heavy metals. As heavy metals are those metals which have toxic effects to living organisms, they cause serious effects in plants. [3] Due to non-bio-degradable and persistent in nature, they cause various effects in plant metabolic pathways in which there are blockage of photosynthetic pathways, disruption of Xylem tissues, stunted plant growth, chlorosis of plant tissues, disruption in Cell biology and etc. A number of heavy metals such as Cu, Zn, Cr, Pb, Mn, Ni, As, Cd and others are present in the environment that causes serious harms to food web. Up to a certain limit, heavy metals are useful for plants as essential elements but out of this limit they are harmful for plant growth. In order to handle such problems, different agronomical and cultural practices have been introduced.

Heavy metals are among the contaminants in the environment. Beside the natural activities, almost all human activities also have potential contribution to produce heavy metals as side effects. Migration of these contaminants into non contaminated areas as dust or leachiest through the soil and spreading of heavy metals containing sewage sludge are a few examples of events contributing towards contamination of the ecosystems.[4] Heavy metal contamination of soil and water alters the quality drinking water, food and ecological environment. Industrial waste is major source of soil pollution that Originate from mining industries, chemical Industries, and the like. these wastes include a variety of

chemicals like heavy metals, phenolics etc., In developing countries like India, application of effluent waste for irrigation of crops causes accumulation of many heavy metals in soil. The ecological risk from heavy metals in soil and in growing drastically. Those heavy metals such as, Cr, ni, and Cd are taken up by the plant body and potential risk for accumulation in human body increases, The heavy metals in higher Concentrations have strong toxic effect on the living organisms and thus know as environmental pollutions[5]. Most on the heavy metals have toxic effect on human netrophils. Chromium is major toxic materials produced from leather tanneries.

MATERIALS AND METHODS

Seed materials

The certified seed of Cotton Ganka kavery (*G.hirsutum* L.,**)** were parched from Tamilnadu Agriculture university. Cotton research station, Coimbatore. Seeds with uniform size. Colour and weight were chosen for experimental purpose

Collection of metal

Potassium Di chromate was selected for this experiment in different concentration Control, 10,20.30.40.100 $mgkg^{-1}$ added from soil.

Pot culture experiment

The experiment was conducted at Botanical Garden Department of botany Government Arts College Dharmapuri .Tamilnadu. Phytoremediation of chromium conducted cotton plants. about 3 kg air dried soil taken in to separate pots. five different concentrations (viz 10,20.30.40.100 mg kg^{-1}) chromium metal prepared and into pot. Control was maintained and irrigated with tap water the inner surfaces of pot polythene sheet. After a week of germination each of treatements include control plants replicated five times

Growth analysis

Plant samples were collected on 30 days after sowing three plants from each replicates of pot was analysed for the various growth parameters such as length and root and shoot

RESULT AND DISCUSSION

At each time of the experiment. plants were collected and determined root and shoot length, number of leaves root and shoot fresh weight and root and shoot dry weights plants replication were collected reduction in seedling dry weight was observed from10 kgmg-1 chromium low toxicity concentration on wards. [6] A degrease in biomass productivity of growth talarance, chromium accumulation increased gradually with increase in 100 mgkg-1 chromium concentrations when compared to other chromium treatments. Similarly root accumulate higher amount of chromium in shoot.[7] Chromium vacuole of the root cells, which may be natural toxicity response and clean up the soil of the G. *hirsutum* plant.

Fig1Morphological parameters different concentration of Chromium(mg/kg^{-1})of *G .hirsutum*

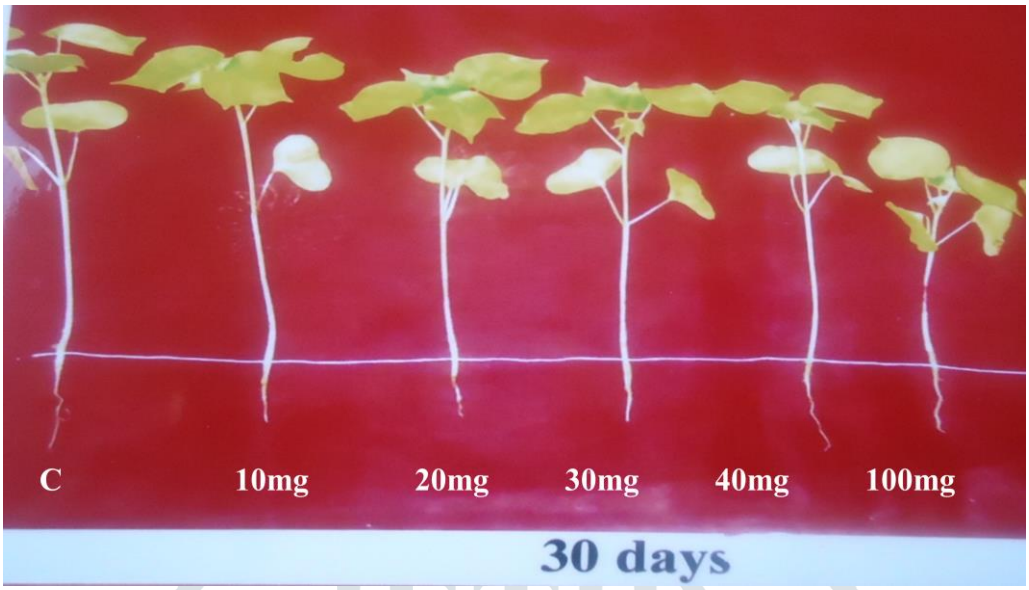

Table 2. Seed germination, seedling of growth(Cm/seedling) seedling fresh and dry weight g/seedling) 30 Days of Cotton (*G.hirsutum*) as different concentrations of chromium

Chromium concentration(mg/l)	Germination percentage	Root length (cm/seedlings)	Shoot length (cm/seedlings)	Dry weight g/seedlings	No of leafs
Control	100	10.6 ± 0.53	15.2 ± 0.76	0.252 ± 0.012	9
10	98.0 -2.0	13.2 ± 0.66	17.3 ±0.865	0.255 ±0.012	12
20	94.0 -6	9.3 ± 0.46	12.0 ± 0.6	0.170 ± 0.008	6
30	85.0 -15	8.5 ± 0.42	10.7 ± 0.53	0.140 ±0.007	6
40	74.0 -26	6.7 ±0.33	9.6 ± 0.48	0.113 ±0.005	5
100	62.0 -38	5.6 ±0.28	7.6 ± 0.38	0.85 ±0.042	4

Standard deviation

Conclusions

Phytoremediation for *G.hirsutum* plant uptake of transport in physiological effects in the environmental genetic techniques. The study molecular response to heavy metals of Chromium. and the identification of genes that express PCs and MTs involved in the detoxification of the metal these will be prove environmental cleanup plants. "ECO FRENDLY' development and create scientific developments among the environmentalists Agriculturalist low

cost techniques (*G.hirsutum)*, suggesting the feasibility of prospect application for the Phytoremediation of chromium remove in polluted sites.

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