

## The Effect of Cadmium Metal on Chlorophyll in *Hordeum Vulgare* by Changing the Soil Phosphate, Organic Matter and Cation Exchange Capacity.



### Botany

**KEYWORDS:** Cadmium, toxicity, chlorophyll, phosphate, CEC, OMw

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### ABSTRACT

*The effect of cadmium on the chlorophyll content of *Hordeum vulgare* by changing the soil conditions was studied in the cadmium treated plants to evaluate in chlorophyll contents showed the positive results of phosphorus treatment and the negative relation of the cadmium toxic effect to the cation exchange capacity. Slightly increase in the chlorophyll amount were observed with increasing the organic matter concentration.*

Plants do not take up and accumulate cadmium from soils as readily as from solution culture because the cadmium ions are not as readily available in soil. The availability of soil cadmium and its uptake and accumulation by plants are affected by many soil factors, including pH. Cation exchange capacity, organic matter, soil moisture, temperature, phosphorus level and other cations or trace elements in the soil. Cadmium inhibits severely several vital, physiological and biochemical processes of plants though the degree may vary from species to species.

### MATERIALS AND METHODS :-

In the study the response of *Hordeum vulgare* to toxic level of 200 µg g<sup>-1</sup> cadmium was studied in the plants growing in thermacul cups. Each cup was taken 200 gram oven dried soil. Either 100 ml. deionized water or different pH and po<sub>4</sub> solutions use were added to the soil to bring the soil pH and po<sub>4</sub> level to the desired concentrations. For clay particles maintaining the CEC of soil and their effects the ratio of sand and was prepared to give soil, sand + metal and clay soil + metal. For organic matter, natural composed manures were taken and mixed with soil to maintain 25%, 50%, 75%, and 100%. After 15 and 30 days, estimation of chlorophyll content of seedling growth was estimated by the method given by Strain and Svec 1966.

### RESULTS AND DISCUSSION:-

In our experiments resulted that the effect of different soil phosphorus levels on the growth of plants was not so specific in comparisons to control. Results showed that may be possible the cause of phosphate ions the uptake of cadmium by plants in the cadmium amended soil were be reduced. In chlorophyll content observed in plants leaves showed the positive results of phosphorus treatment (Table-1)

**Table 1: \*Effect of soil PO<sub>4</sub>, PO<sub>4</sub>+Cd on chlorophyll contents of plants after 15 days and 30 days**

Concentration	Total chlorophyll [µg g <sup>-1</sup> ch fresh wt.]	
	15 day plant	30 day plant
Control [DW]	320	300
200 ppm Cd	257	240
1 m PO <sub>4</sub> -	191	208
0.1 mPO <sub>4</sub> -	303	284
0.01m PO <sub>4</sub> -	314	293
0.001m PO <sub>4</sub> -	331	306
1 m PO <sub>4</sub> - + 200 ppm Cd	227	214
0.1 PO <sub>4</sub> - + 200 ppm Cd	313	247
0.01 PO <sub>4</sub> - + 200 ppm Cd	296	232
0.001 PO <sub>4</sub> - +200 ppm Cd	279	267

\*Average Value

**Table 2: \*Effect of soil CEC and CEC+Cd on chlorophyll contents of plants after 15 days and 30 days**

Concentration	Total chlorophyll [µg g <sup>-1</sup> ch fresh wt.]	
	15 day plant	30 day plant
Control [DW]	1470	1180
Sand + 200 ppm Cd	825	758
Clay + 200 ppm Cd	981	866

\*Average Value

**Table 3: \* Effect of organic matter and OM+CD on chlorophyll contents of plants after 15 days and 30 days.**

Concentration	Total chlorophyll [µg g <sup>-1</sup> ch fresh wt.]	
	15 day plant	30 day plant
Control [DW]	1160	1204
200 Ppm Cd	913	816
25% OM	829	901
50% OM	901	1066
75% OM	903	1136
100 % OM	902	1273
25% OM + 200 ppm Cd	840	889
50% OM + 200 ppm cd	107	215
75% OM + 200 ppm cd	108	219
100% OM + 200 ppm Cd	109	231

\*Average Value

It has been reported that when the phosphate was added on the phosphorus deficient soils, it might be decreased cadmium accumulation effect caused by large increased in plant yield, but when the soil phosphorus supply was adequate phosphorus additions apparently increased both cadmium accumulation and plant yield (williams and David , 1976). Our experimental findings showed the negative relation of the cadmium toxic effect to the Cation Exchange Capacity of plant growing medium. (Table-2) . As we used the two types of growing medium sand and clay soil for seeing the effect of cadmium in two different CEC conditions. Chlorophyll contents of clay growing plants resulted higher amount in comparison to plants grown in black soil, though the cadmium concentration was used same in both soils. Although in both soil conditions amended with cadmium the amounts of chlorophyll content were lower than control plants. It has been observed that cadmium uptake is decreased with increasing the cation exchange capacity of soil . The reason for this relationship may be due to the greater capacity of the higher CEC soils to adsorb cadmium ions (williams and David 1973, Haghiri 1974, Miller et.al 1976). Slight increase in chlorophyll amount were observed with increasing the organic matter concentration without and with cadmium treatment. We can't say properly the effect of cadmium on chlorophyll from our findings. (Table-3). Several Investigators have reported decreased cadmium uptake with increasing the percentage of soil organic matter probably because of then increased capacity of the soil to adsorb cadmium with increasing organic matter content (John et.al. 1972, Haghiri 1974, MacLean, 1976 ).

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