

Biochemical Analysis of Total Heavy Metals of Soil and Parts of *Cicer Arietinum* Plant of Road Side at District Saharanpur (U.P)

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Abstract *Cicer Arietinum*–(Gram) belongs to family leguminosae. It is one of the most important pulse crops. In order to find out total heavy metal contents of soil and plant parts of *Cicer Arietinum* the total heavy metal studies were carried out on *Cicer Arietinum* plant under field conditions i.e growing at the nearest from 20 mt. away from road side i.e. from the point of automobile exhaust discharge (polluted= experimental) and 200 mt. away from road side of automobile discharge point (control = unpolluted). Heavy metal enter in our environment, through various anthropogenic activities such as metalliferous mining and smelting, agriculture, waste disposal or industry discharge a variety of metals such as silver(Ag), arsenic(As), gold(Au), cadmium(Cd), cobalt(Co), chromium(Cr), copper(Cu), mercury(Hg), nickel(Ni), lead(Pb), palladium(Pd), platinum(Pt), radium(Rd), strontium(Sn), thorium(Th), uranium(U) and zinc(Zn). Release of these metals without proper treatment possess a significant threat to both environment and public health, as they are non biodegradable and persistent. Results indicates that total heavy metal in general are found in farm soil and plant parts of those plant which are grown near road (20 mt.) or polluted site i.e. those obtained from the experimental farm site near automobile discharge point.

Keywords: *Cicer Arietinum*, Heavy metals, biochemical studies

1. INTRODUCTION

Western U.P. is the read basket of India, but due to pollution everything is not right at this region. Pollution is a major culprit in environmental degradation. With rapid progress of urbanization and industrialisation of the country accompanied with indiscriminate fall out of waste substances resulted in the suffering of life sustaining systems. The load of pollutants in the aerial atmosphere as increased many fold due to automotive exhaust and industrial emission, organic vapours, carbon monoxide, sulphur dioxide, unburnt hydrocarbon and heavy metals like nickel, arsenic, cadmium and titanium etc. released into the air are hazardous to human health, vegetation, flora and fauna. The response of plants to pollution is variable and depends on the individuals genotype, age, stage of growth, proximity and concentration of pollutants. It may effect the stomatal behaviour morphology, anatomy, germination capacity, phenology etc.

2. MATERIAL METHOD

For these studies plant parts were carefully collected from the unpolluted and polluted soil sites keeping the root and shoot system intact from the mature plant. These plant parts were thoroughly washed to remove soil and mineral particles. The root, shoot, pod/fruit and seed parts of these plants were separated and oven dried at 70⁰ C for 36 hours. Similarly, soil samples of both these farm field were also collected. These soil samples were kept in polythene containers already washed with 1:1 nitric acid and deionized water to avoid adsorption of heavy metals on the container walls and to preserve the samples for subsequent analysis of total heavy metals.

3. ESTIMATION OF TOTAL HEAVY METAL

For the estimation of total heavy metal, the digestion was done by concentrated nitric acid (conc. HNO₃) and 60% perchloric acid (HClO₄). Later from the digest, the total heavy metal contents were extracted in purified dithizone (Sandell, 1950) and estimated colorimetrically.

4. RESULT AND DISCUSSION

Table 1: Total heavy metal of soil and plant parts of Gram growing under field condition near road side (20 mt = experimental and also away from road side 200 mt = control) towards Saharanpur Ambala road.

Study site	Farm soil	Root	Shoot	Pod	Seed
mg/gm Dry Weight					
At Vegetative Stage					
Control	0.286	0.068	0.060	---	---
Experimental	0.320	0.076	0.080	---	---
At Flowering Stage					
Control	0.300	0.076	0.085	---	---
Experimental	0.346	0.088	0.100	---	---
At Yield Stage					
Control	0.320	0.100	0.095	0.028	0.046
Experimental	0.360	0.120	0.120	0.034	0.071

Results of total heavy metal in the plant part collected from different distances along road side is shown in table-1. Table shows that in general on mg/gm dry weight basis total heavy metal increases in plants grown near road side i.e. 20 mt. distance near road side. Thus, total heavy metal in soil at vegetative, flowering and yield stages are ca. 111%, 115%, 113% of the control site soil respectively. These values of total heavy metal further increases in plant parts of road side plants. Thus, total heavy metal in root at three stages are ca. 115%, 116%, 120% of the control site grown plants respectively. Table further shows that these value in shoot are ca. 147%, 116%, 126% of the control site at three stages of growth. These studies done in pod and seed also. Thus, total heavy metal in experimental pod and seed are ca. 121%, and 154% of control plant.

Table 2: Total heavy metal of soil and plant parts of Gram growing under field conditions near roadside (20 M= Experimental and also away from road side 200 M = Control) towards Saharanpur Delhi road.

Study site	Farm soil	Root	Shoot	Pod	Seed
mg/gm Dry Weight					
At Vegetative Stage					
Control	0.260	0.060	0.048	---	---
Experimental	0.320	0.086	0.080	---	---
At Flowering Stage					
Control	0.308	0.070	0.085	---	---
Experimental	0.360	0.090	0.100	---	---
At Yield Stage					
Control	0.324	0.090	0.098	0.036	0.038
Experimental	0.395	0.116	0.118	0.048	0.058

Table2 shows that on Saharanpur Delhi road the total heavy metal in root, shoot, pod, and seed part of yield stages are ca. 129% , 120%, 133%, and 152% of the control respectively in Gram plant grown near 20mt. distance of road side. Likewise these values of total heavy metals 20mt. distance soil at three stages of studies are 123%, 117%, and 122% of the control soil present at 200mt. distance away from road side.

Table 3: Total heavy metal of soil and plant parts of Gram growing under field conditions near roadside (20 M = Experimental and also away from road side 200 M = Control) towards Saharanpur Dehradun road.

Study site	Farm soil	Root	Shoot	Pod	Seed
mg/gm Dry Weight					
At Vegetative Stage					
Control	0.250	0.072	0.068	---	---
Experimental	0.276	0.093	0.086	---	---
At Flowering Stage					
Control	0.280	0.079	0.08	---	---
Experimental	0.320	0.100	0.106	---	---
At Yield Stage					
Control	0.300	0.106	0.102	0.038	0.046
Experimental	0.350	0.122	0.119	0.050	0.060

In the same manner table-3 also shows the level of total heavy metal in soil and Gram plant parts grown near road side(20mt.=Exeprimental) and also away from road side (200mt.=Control) at Saharanpur Dehradun road.Result shows that total heavy metal increases plant parts with the ages. Thus, total heavy metal in exeprimental plant root, shoot, fruit and seed of Gram plant at yield stages are ca. 115%, 117%, 131% and 130% of the control plant respectively.Similarly these studies also done in soil of 20mt. distance and 200mt. distance areas. Thus, total heavy metal in soil of 20mt. distance at three stages of studies are 110%, 114% and 117% of the 200mt. distance soil i.e. control site.

5. CONCLUSION

Thus, all these studies concludes that on mg/gm dry weight basis total heavy metal found more near road side due to automobile exhaust and other similar pollution activities.

6. SUGGESTIONS

It has cleared from above data that heavy metals in road side plants is probably linked to the quantity of automobile exhaust pollutants or traffic density on the road side.Thus, in view of health safety it is suggested that while using plant one must avoid road side plant in order to reduce the intake of heavy metal in the body.

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