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STUDIES ON THE IMPACT OF LEAD ACETATE ON THE GROWTH AND BIOCHEMICAL CHARACTERISTICS OF *Abelmoschus Esculentus* (L.) MEDICUS

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Abstract: Impact of cadmium Lead acetate toxicity at various concentrations *viz*., 2mM, 4mM, 6mM(M/V) was analysed on growth and biochemical characteristics of *Abelmoschus esulentus*. The germination was inhibited beyond 4 mM concentrations. A gradual decrease in growth reflected the corresponding decline in biochemical characteristics too. Photosynthetic pigment content such as chlorophylls and carotenoid remained reduced with increasing concentration of cadmium chloride. Similar trend was also noticed in the case of protein and soluble sugar on the contrary the level of free amino acids was found increased with increase in concentrations of cadmium chloride.

Keywords: *Abelmoschus esulentus*, Lead acetate, growth parameters, biochemical and enzyme parameters.

Introductions

Heavy metal pollution and its toxicity to the environment is one of a major problem faced by several developed and under developing countries because of the rapid increase in population and industries in and around cities. Among all these metals, Lead have considerable attention over the years as a result of increased environmental contaminant at higher concentrations. It toxic to plants (Leon et al., 2002) when the cadmium concentration in soil is more, vegetation become very poor. In the present study the experiments were conducted to find out the effect of Lead acetate on the growth and biochemical characteristics of *Abelmoschus esulentus* (L.) Madicus.

Material and Methods

Seeds of *Abelmoschus esulentus* were soaked as various concentration of (2mM, 4mM, 6mM) Lead acetate for 2 hours. Seeds were soaked in distilled water for 2 hours and kept as control. Both control and experimental seeds were grow in plastic trough containing a mixture of three types of soil *viz.,* red, black and sand in the ratio of 1:1:1. The experimental

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through were watered everyday with respective concentrations of Lead acetate, whereas control is supplied with tap water. Three replicates were maintained for each concentration of Lead acetate. After 20 days of treatment the various growth as well as pigment content (chlorophyll *a, b*, total chlorophyll and carotenoid (Wellburn and Lichtenthaler 1984) and biochemical parameters total soluble sugar (Mancinelli, 1973) protein content (Jayaraman, 1981) aminoacid content (Lowry, 1951) proline content (Bates, et al 1973) *invivo* nitrate reductase activity (Jaworski, 1971) catalase (Kar and Mishra, 1976) and peroxidase activity (Addy and Goodman, 1978) were studied along with control sets.

Results and Discussion

There was a decrease in the percentage of seed germination in all the plants treated with Lead acetate. Germination of seed, shoot length, root length, fresh weight and dry weight was gradually decrease with increasing in the concentration of heavy metal (Table 1). The similar trend was observed by (Al-Yemini and Al-Hetal, 2001) in *Vigna ambacensis.* The reduction in leaf size is due to the interaction of Lead on the growth and metabolism. The Lead reduces the growth of leaves due to death of the cells contaminated with cadmium and is also reported in plants (Koeppe and Miller, 1973).

The chlorophylls, carotenoids (Fig1), total soluble sugar, protein (Table 2) and nitrate reductase activity also should declining trend. In contrary the leaf nitrate, free amino acids, proline (Table 2) and catalase and peroxidase activity was (Table 3) increased with increasing the concentration of Lead acetate.

The pronounced initiation of shoot and root growth are the main case for the decrease in fresh and dry weight of seedlings, uptake of metals occurs primarily through the root (Arduini et al., 1996). Similarly the reduction of leaf area is response to Lead acetate treatment was also related to accumulation of Lead in leaves, where the size of the leaf also decreased. Similar result was observed (Panday and Pathak 2006) in nickel treated green gram seedlings (Pandey and Sharma, 1999).

The reduction in sugar contents may be attributed to reduction in chlorophyll contents of the leaf and also a decline in protein. This change might have already affected the photosynthetic activity of the plants .Accumulation of proline & free amino acid has been frequently used as biochemical marker for water stress in plants (Alia and Saradhi, 1991). In stress condition the inhibition of growth of cells and whole plant were accompanied by an accumulation of nitrate in plant tissue particularly in leaves (Sinha and Nicholas, 1981). The

leaf nitrate content was found to be more in metal treated plants paralleling with the reduction in nitrate reductase activity.

The peroxidase activity was reported to be increased with the increase in the concentration of Lead acetate, it cause a major impact on the chlorophyll degradation. Catalase is special type of peroxidase enzyme which catalase the degradation of H_2O_2 which is natural metabolite, and also toxic to plants (Balasinha, 1982).

Conclusion

The results of the study clearly indicates that the Lead toxicity. Various concentration of Lead acetate inhibits the growth are biochemical characteristics of *Abelmoschus esculentus.*

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Table 1

Effect of Lead acetate on the growth parameters of *Abelmoschus esculentus.*

S.No	Parameters	Control	2mM	4mM	6mM
1	Germination percentage	95.0±0.06** (100)	78.3±0.12** (82)	53.3±0.42** (56)	38.3± .52** (40)
2	Shoot length(cm)	15.29±0.34** (100)	10.79±0.06** (70)	8.11±0.10** (53)	4.60±0.04** (30)
3	Root length (cm)	8.29±0.15** (100)	6.67±0.06** (80)	4.59±0.14** (55)	1.59±0.03** (19)
4	Shoot fresh weight (mg)	443±5.05** (100)	339±2.28** (76)	208±3.6** (47)	102±1.5** (23)
5	Root fresh weight(mg)	59.2±0.44** (100)	48.2±0.50** (81)	39±0.45** (65)	29±0.57** (48)
6	Shoot dry weight(mg)	75.5±1.05** (100)	61.0±0.83** (80)	47.0±0.89** (62)	32.5±1.25** (43)
7	Root fresh weight(mg)	22.3±0.36** (100)	18.6±0.49** (82)	13.5±0.40** (60)	7.3±0.32** (32)

Values are an averages of five observation. Values in parenthesis are percentage activity with respective control. Mean±SE** Significance at P<0.05 level

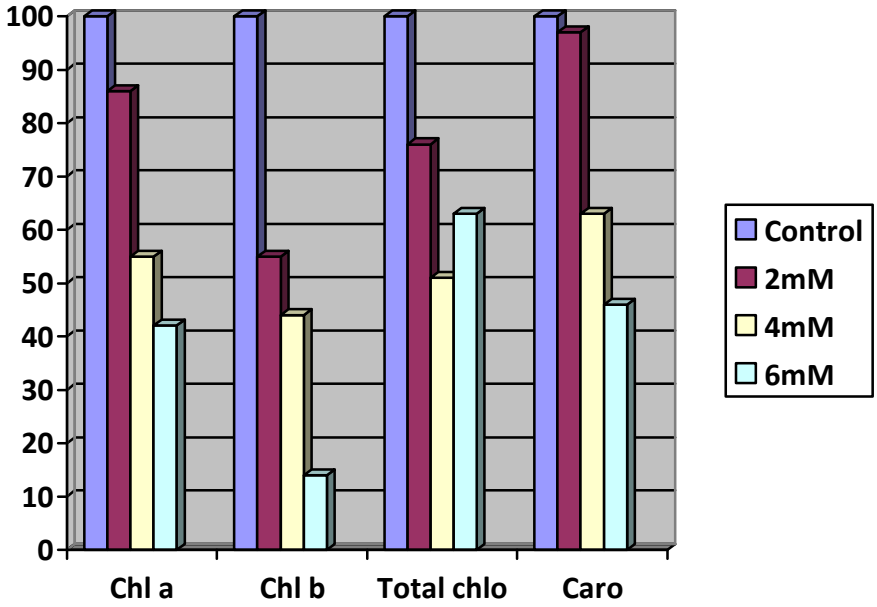

Figure 1: Effect of Lead acetate on the pigment content of *Abelmoschus esculentus.*

Table 2: Effect of Lead acetate on the biochemical parameters of *Abelmoschus esculentus.*

S.No	Parameters	Control	2mM	4mM	6mM
1	Total soluble protein(mg/gLFW)	22.75±0.273** (100)	18.19±0.066** (79)	13.88±0.119** (61)	9.80±0.096** (43)
2	Total soluble sugar(mg/gLFW)	172.7±1.017** (100)	152.0±0.666** (88)	120.2±0.632** (69)	93.3±1.387** (54)
3	Free amino acid(mg/gLFW)	3.05±0.269** (100)	6.99±0.270** (229)	10.12±0.585** (331)	15.18±0.908** (497)
4	Proline(mg/gLFW)	0.497±0.054** (100)	5.789±0.051** (128)	6.806±0.055** (151)	7.392±.006** (164)
5	Leaf nitrate (µmole/gLFW)	33.9±0.333** (100)	51.9±0.474** (153)	59.23±0.453** (174)	81.23±0.006** (239)

Values are an averages of five observation. Values in parenthesis are percentage activity with respective control. Mean±SE** Significance at $P < 0.05$ level

Table 3: Effect of cadmium chloride on the enzyme parameters of *Abelmoschus esculentus.*

Sl. No	**Parameters**	**Control**	**2mM**	**4mM**	**6mM**
1	Nitrate reductase activity((µmole/30min)	6.52±0.113** (100)	3.60±0.153** (52)	1.17±0.0704** (26)	0.02±0.0688** (15)
2	Peroxitase activity(µmole/gLFW)	154.3±3.35** (100)	196.9±0.218** (127)	247.3±2.185** (160)	304.0±0.351** (197)
3	Catalase activity(µmole/ml)	0.0009±0.076** (100)	0.0014±0.112** (155)	0.0027±0.067** (300)	0.0043±0.654** (477)

Values are an averages of five observation. Values in parenthesis are percentage activity with respective control. Mean±SE** Significance at $P < 0.05$ level