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EFFECT OF LEAD ACETATE ON THE GROWTH OF BLACK GRAM (*VIGNA MUNGO* L.)

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ABSTRACT

Lead toxicity in soil has become a global issue due to increase and high demand of safety food. In the present investigation an attempted were made on the toxicity effect of lead acetate on the germinal growth of Black Gram seeds. The seeds were influenced to germinate under various concentration of Lead Acetate (Control, 10 mM, 20 mM, 30 mM, 40 mM and 50 mM). The seed germination root length parameters and total chlorophyll estimation were analyzed. Increasing in the concentration of Lead causes drastic reduction in the seed germination and also wide influenced in the decreased level of chlorophyll content. The result reflects that the Lead is toxic to crop growth and development.

KEYWORDS: Lead Acetate, Black Gram, Seed germination, Chlorophyll content.

INTRODUCTION

Rapid growth of industries and its activities leads to major pollution. Among them Lead is one of the heavy metal which is released as effluents from the industrial wastes. In soil, Lead is a heavy metal retention from 150 to 5000 years, which is not essential for biological activities (Roane, 1999). Heavy metal is highly phytotoxic and non biodegradable present in the agricultural land. However, exceeding level of heavy metal induces adverse abnormalities in plant metabolism (Shoaib *et al.*, 2011). In animals, the toxicity of Lead affects the reproductive function in both female and male (Jabeen *et al.*, 2010). Black Gram (*Vigna mungo* L.) Belongs to the family Leguminosae, sub family Fabaceae have the capability to uptake heavy metals from the contaminated soil (Bishnoi *et al.*, 1993). Black Gram is originated in india which is cultivated from ancient times. It's a legume plant rice in nitrogen

content, and short life span of 90-120 days. It is nutrient rich in 20 to 25% of proteins, 40 to 47% of carbohydrates and essential vitamins recommended for diabetes (Nilanthi *et al.*, 2014). Black Gram is a very good source of phosphorous and has a significant role in lipid lowering action recommended for cardio vascular problems (Indira and Kurup, 2003). The main objective of the present investigation deals with the impact of Lead acetate on the germination and the total chlorophyll content were measured.

MATERIALS AND METHODS

Plant Material and Sample collection

Black Gram (*Vigna mungo* L.) healthy seeds were obtained from Seed Collection Centre, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu. The seeds were stored in a sterile vessel at room temperature.

Surface sterilization

Surface sterilization of seeds was done by using Meryem *et al.*, 2013 and Chawla, 2002. Healthy seeds were selected and preceded for surface sterilization with 70% alcohol for 30 sec in a beaker, followed by the seeds were treated with 20% hypochlorite solution for 10 min. The seeds were subjected to with 0.1% $HgCl_2$ for 2 min. Seeds were washed with sterilized distilled water.

Culture condition and treatment with lead acetate

The sterilized petriplate were prepared with agar of various concentrations (Control, 10 mM, 20 mM, 30 mM, 40 mM, 50 mM) of lead acetate. After surface sterilization of seeds the seeds were cultured in a sterile petriplate containing agar each plate should contain 5 seeds of various concentration of lead acetate. The plates were incubated at 27˚C with 4000 lux light intensity and humidity of 60 to 70 (16 h photoperiod) for four days. Periodically check the plates for contamination. After four days of incubation the germination rate of seeds were measured by using formula (Baskaran *et al*., 2009)

$$\text{Germination\%} = \frac{\text{Germination seeds}}{\text{Total seed}} \text{ x } 100$$

Chlorophyll Estimation: The estimation of chlorophyll was done by Arnon s, 1949. 100 mg of germinated shoot material were taken and ground with sterile pistil and mortar with 10 ml of 80 % acetone. The homogenate were collected and centrifuged at 1000 g for 10 min. The supernatant containing chlorophyll was used for estimation. The total chlorophyll estimation was done by using UV – spectrophotometer absorbance at 645 nm and 663 nm.

Total chlorophyll (mg g^{-1}FW) = (0.0202) x (OD 645) + (0.00802) x (OD 663)

RESULT AND DISCUSSION

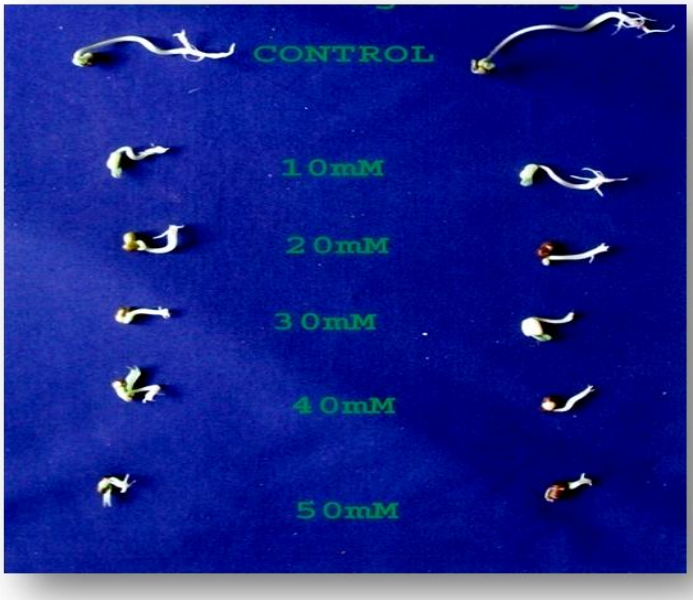

Fig.1. Effect of Lead acetate on growth of *Vigna mungo*

The *Vigna mungo* seed supplied with different concentration of lead acetate for germination showed adverse effect in growth and development and the results were showed in Fig.1. Effect of lead acetate on growth of vigna mungo, were tabulated in Table 1. Similar results are in concordance with present finding that most cases heavy metal induces high toxicity in plants (Shoaib *et al.,* 2011). The higher germination percentage was observed in control plant, however increase in concentration of lead acetate the germination percentage get decreased i.e., at 10 mM-95%, 20 mM-82%, 30 mM-82%, 40 mM-70% and 50 mM-40% similar findings were reported by Baskaran *et al.,* 2009. The reduction in seed germination percentage may be due to toxic metabolites, higher amount of solid metals and osmotic relationship between seed and water (Baskaran *et al.,* 2009). As the concentration increase the root length shows variation, a gradual decrease in the root length was recorded. Similar

finding were reported by Kumar and Bhargava, 1998. Chlorophyll estimations is one of the important parameter used for the production capacity. After 4 days of incubation the shoots were analysed for chlorophyll estimation. The control sample contain 0.05 mg g^{-1} and however increasing in concentration of lead acetate leads to reduction in chlorophyll content similar result was observed by Baskaran *et al.*, 2009. It may due to the formation of enzymes Chlorophyllase which causes chlorophyll degradation (Neelam, 1985).

Table.1: Effect of Lead Acetate on Growth of *Vigna Mungo*

S. No.	Concentration of Lead acetate (mM)	Germination percentage (%) after 4 days of incubation	Measurement of root (in cm) After 4 days of incubation	Total chlorophyll estimation (mg g^{-1}) after 4 days of incubation
1	Control	100	9.5 ± 0.25cm	0.240
2	10mM	95	4.8 ± 0.31cm	0.209
3	20mM	82	2.3 ± 0.15cm	0.188
4	30mM	82	1.3 ± 0.05cm	0.152
5	40mM	70	1.10 ± 0.05cm	0.139
6	50mM	40	0.4 ± 0.02cm	0.094

SD: < ± 0.5

CONCLUSION

The present study revealed that the increases in concentration 10 mM to 50 mM of Lead Acetate causes drastic reduction in the germination and seeding growth of *Vigna mungo* seeds and also there is a heavy yield and loss in the productivity due to decreases in the chlorophyll content might be the action of chlorophyllase. There is a wide requirement of transgenic crop shows resistance against toxic metal Lead acetate and this present investigation may be extended to produce transgenic metal resistant crop of *Vigna mungo.*

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