Growth and Biochemical Changes in Pisum Sativum under Lead Stress

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Abstract—*Lead is one of the most frequently encountered metal in environment. Tncreasing concentration of lead in agricultural soil is matter of concern. Present study was conducted to investigate the effect of lead on Pisum Sativum. studies were conducted on 100ppm,400ppm,800ppm lead concentration. Lowest Concentration of lead stimulate growth and photosynthesis .Higher concentration retard the growth, photosynthesis and sugar content, while a constant increase in prolein concentration was increase with concentration. results from present investigation suggests that lead accelerate the growth and photosynthesis while higher concentration is phototoxic for Pisum Sativum.*

1. INTRODUCTION

Lead is the most common heavy metal in the environment .Now a day's increasing lead concentration in agricultural soil is matter of concern .According to US environment protection agency natural level of lead in soil range between 50 to 400 ppm. Increased concentration of lead cause physiological and biochemical changes in plants. Major Sources of lead contamination are mining, smelting of metaliferous ores, burning of lead gasoline, disposal of municipal sewage and lead based paints [12,18] . Lead is among those metals which at elevated concentration constitute a potential threat to environment and human health [17]. Excess lead accumulation in plants tissue can be toxic to most plant root and shoot elongation, chlorophyll inhibition [24,8,9] . Pisum Sativum is one of the major cereal crop grown in India so it's important to study the effect of lead to evaluate its positive or negative aspects on physiology and biochemistry. In Present study we are investigating the effects of lead on pisum Sativum Physiological and biochemical aspect.

2. MATERIAL AND METHOD

Plants were grown in three different concentration of lead 100ppm, 400ppm, 800ppm in set of three replicates. Seeds were sterilized by 0.1 mercuric chloride for two minutes.

2.1Growth measurement

Root growths were measured after 4 days and shoot length were analyzed after 30 days with the help of centimeter ruler. Germination percentage was calculated after 4 days germination.

2.2 Chlorophyll

Chlorophyll were estimated by using method describe by [6] with 80% acetone. .sample were taken after 30 days. Absorbance was read at 645nm and 663nm in spectrophotometer.

2.3 Estimation of Reducing Sugar

Sugar was estimated using [2]. Samples were collected after 30days. .Absorbance was taken at 490nm.

2.4 Prolein

Protein was determined according to [13] with ninhydrine . Samples were collected after 30 days. The absorbance was measured in a spectrophotometer at 520 nm using toluene as blank.

3. RESULT AND DISCUSSION

3.1 Germination Percentage

Germination percentage was found highest in control which shows 100% germination on fourth day. Germination percentage show little variation on 100ppm and 400ppm concentration seeds (Fig. 1)800ppm show lowest germinations rate of 70%.[3,14] supports the reduction of germination percentage on increasing dose of heavy metals.

3.2 Root and Shoot Growth

Root length show progressive decrease in length (Table 1).Control plant show maximum length of 1±0.124 on the other hand 800ppm show lowest0.7±0.163. roots store heavy metals to some extent which decrease the root growth [21]. In present study highest shoot growth 16.1±0.294 was observed in 100ppm similar growth enhancement at low concentration of lead was observed by [7,11]. [14] observed growth reduction under metal stress on Pisum Sativum and wheat under cadmium and lead stress. Higher concentration 400ppmm and 800ppm show growth retardation.

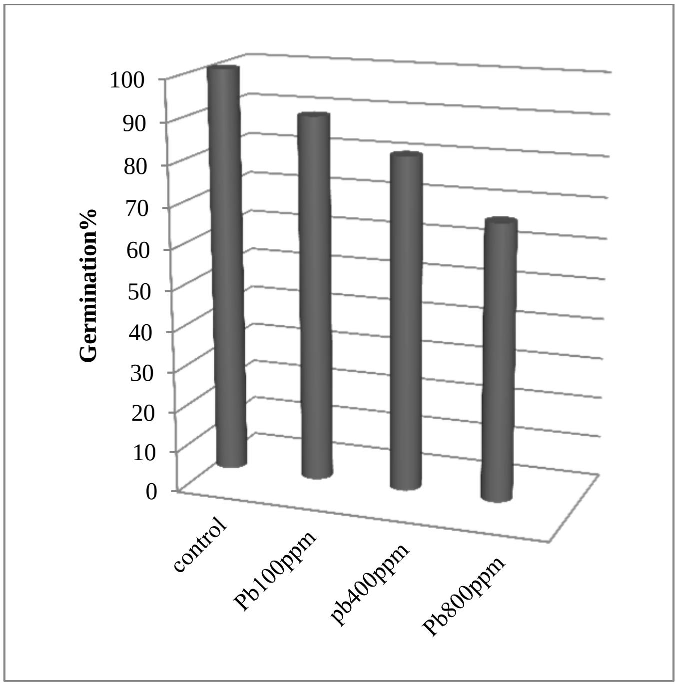

Fig. 1-Lead effect on germination% of Pisum Sativum

Table 1 Effect of lead on Shoot and Root Length

Treatment	Shoot Length(cm) (Mean ±S.D)	Root Length(cm) (Mean ±S.D)
Control	14.4±0.731	1±0.124
Pb100ppm	16.1±0.294	1±0.081
Pb400ppm	13.4±0.449	0.766±0.205
Pb800ppm	11±0.821	0.7±0.163

3.3 Chlorophyll

Plants grown in 100ppm concentration of lead show slight increase in chlorophyll a than control after that a constant decrease in chlorophyll with concentration was observed(Table-2) on the other hand constant decline in pigment concentration of chlorophyll b was observed. Total chlorophyll show same trend as chlorophyll a. heavy metals may cause alteration in photo system II which change chlorophyll level in plant [23]. [22] observed decrease in chlorophyll content on higher concentration of mercury.

3.4 Sugar

Control show highest sugar content .on the other hand treated plants .sugar content decrease respectively with increase in concentration (Fig. 2). [19] Repotted decrease in sugar content in lead stress. [1] Observed decrease in sugar content under zinc stress.

3.4 Prolein

Prolein get accumulate in plants when exposed to abiotic stress [19].similar observation was found in present study plant grown in 800ppm lead concentration show highest value of 10.5mg/g which is 7.3mg/g higher than control .prolein concentration is increased with lead stress(Fig. 3).[5] suggested that prolein accumulation may be result of osmotic adjustment at cellular level.prolein heps to overcome from stress it act as energy reserviour helps to survive in stress condition .

Table 2 Lead Effect on Chlorophyll content (mg/g) of Pisum Sativum

Treatment	Chlorophyll a	Chlorophyll b	Total chlorophyll
Control	0.941	0.706	0.295
Lad 100ppm	0.975	0.669	0.299
Lead400ppm	0.931	0.445	.0792
Lead800ppm	0.834	0.327	0.008

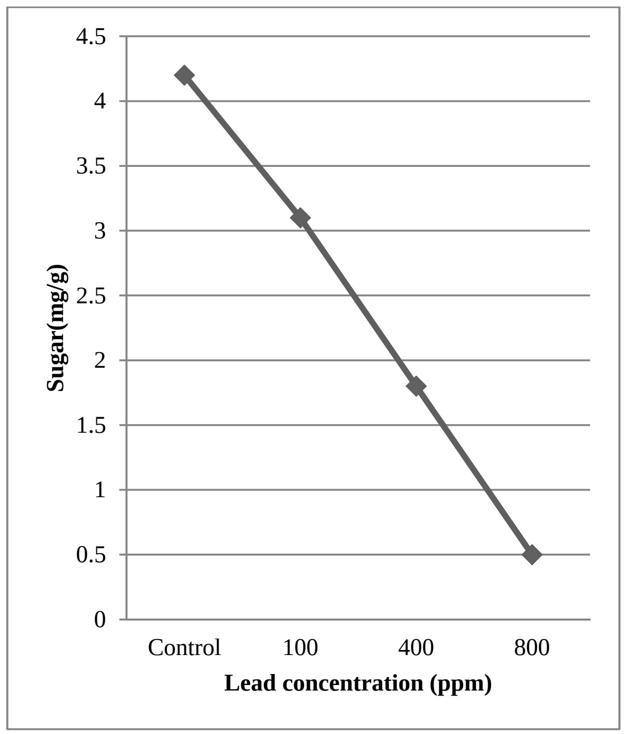

Fig. 2 Efeect of Lead on sugar content of Pisum Sativum

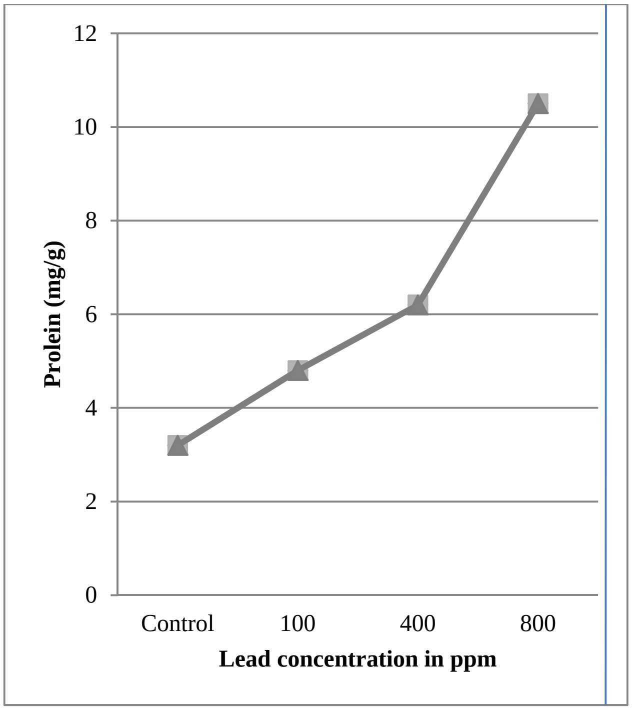

Fig. 3 Effect of prolein content on Pisum Sativum

4. CONCLUSION

Present observation indicates that at lower concentration lead increase shoot growth and chlorophyll which may be beneficial for plant morphology. Higher concentration of lead decrease growth, chlorophyll, sugar and increase prolein content at higher extent. Conclusively we can say that lower concentration of lead is good for Pisum Sativum morphology but at higher concentration it produce negative effect plant morphology and biochemical aspect of Pisum Sativum.

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