وقائع مؤتمرات جامعة سبها
Sebha University Conference Proceedings

Confrence Proceeeding homepage: http://www.sebhau.edu.ly/journal/CAS

Response some plants to ionic toxicity of zinc and lead chloride

*Widad Saed El-Mugrbi, Entesar M. Ibrahim, Ahmed S. Ibrahim

Department of Botany, Faculty of Art and sciences Ghemines, University of Benghazi, Benghazi, Libya.

A B S T R A C T

Environmental pollution is one of the major sources of health menace. heavy metals are considered more dangerous than other pollutions for the reason that heavy metals cannot be devastated by degradation. The present study was conducted to response of three plant species (Cucumber, Sun flower and Tomato) to ion toxicity of Zinc and Lead chloride salts. Used different concentrations of heavy metals (Zn and Pb) as impact on germination period and seedling development stages of target plant species. Results showed that, different levels of heavy metals ($ZnCl_2$ and $PbCl_2$) caused decrease of germination parameters of cucumber plant, while Shoot length and fresh weight of same plant were increased with increasing lead and zinc chloride levels as compared with control. Tomato plant was highly sensitive to different concentrations of lead and zinc chloride. Whereas, all germination parameters decrease with increased heavy metal treatments except germination percent and coefficient velocity of germination were increased especially at the levels at 1000 and 1500 ppm. Sun flower plant was more respond of heavy metal treatments, where, germination parameters (germination percent, mean germination time, mean daily germination and coefficient velocity of germination) were increased under these compounds. Different levels of lead and zinc chloride were enhanced dry weight of sun flower seedling especially at 1500 and 1000 ppm as compared to control. The results this study concluded that, *Helianthus annuus* L. was more respond of heavy metals, and after it comes *Cucumis sativus* L. while *Lycopersion esculentum* L. were the most sensitive.

ستجابة بعض النباتات لسمية الايونية لكلوريد الخارصين و الرصاص

وداد سعد المغربي، انتصار ميلود إبراهيم ، أحمد صالح ابراهيم

قسم النبات, كلية الاداب و العلوم قمينس, جامعة بنغازي, بنغازي, ليبيا

الملخص

يعد التلوث البيئي احد المصادرالرئيسية الاخطرللصحة. المعادن الثقيلة تعتبر اكثرخطورة من الملوثات الاخرى نظرا لعدم امكانية تدميرها عن طريق التحلل. اجريت الدراسه الحالية لاستجابة ثلاثة انواع نباتية (الخيار,دوار الشمس و الطماطم) للسمية الايونية لاملاح كلوريد الخرصين و الرصاص.استخدمت تركيزات مختلفة من المعادن الثقيلة (كلوريد خارصين و الرصاص) كمؤثرعلي فترة الانبات ومرحلة تتطورالبادرة للانواع النباتات المستهدفة في الدراسة. النتائج أوضحت ان المستويات المختلفة من المعادن الثقيلة (Zncl2 and Pbcl2) سببت انخفاض في قياسات الانبات لنبات الخيار, بينما طول الساق و الوزن الطري لهذا النبات كانت تزداد مع زيادة مستويات كلوريد الرصاص والزنك مقارنة بالمشاهد. نبات الطماطم كان عالي الحساسية لتركيزات المختلفة من كلوريد الرصاص والخارصين. حيث كانت كل قياسات الانبات تنخفض مع زيادة معاملات المعادن الثقيلة بأستثناء نسبة الانبات ومعامل سرعة الانبات التي كانت تزداد خصوصاعند التركيزين 1000و1500جزء من المليون. دوارالشمس كان اكثراستجابة لمعاملات المعادن الثقيلة, حيث كانت قياسات الانبات (نسبة الانبات, متوسط زمن الانبات, المتوسط اليومي للانبات ومعامل سرعة الانبات) تزداد مع زيادة هذه المركبات. المستويات المختلفة من كلوريد الخارصين والرصاص كانت تزيد من الوزن الجاف لبادرات دوارالشمس وخصوصا عند التركيزين 1500 و1000جزء من المليون مقارنة بالمشاهد. لخصت نتائج الدراسة ان نبات دوارالشمس كان اكثراستجابة للمعادن الثقيلة وبعد ذلك نبات الخيار بينما نبات الطماطم كان اكثر حساسية لهذة المركبات المستخدمة.

*Corresponding author:

E-mail addresses: Widad.misbah@uob.edu.ly , (E. Ibrahim) Sasealmshity@gmil.com, (A. Ibrahim) afayd498@gmil.com.

Introduction:

Environmental pollution by heavy metals may be nature process such as weathering of rocks or volcanic eruptions, or anthropogenic pollution is generally caused by some different industry, transport, municipal waste management, landfill in addition to the use of fertilisers [1]. Human exposure to heavy metals has caused of serious health problems all over the world [2]. commonly, heavy metals producing toxicity in plants divided into two groups, first, the essential heavy metals that play an important role in normal growth and metabolic processes in plants, such as ferric (Fe), zinc (Zn), nickel (Ni) and copper (Cu) [3]. Plants tissues need to these metals at low levels, for example nickel and zinc ranges in dry plant tissue are 0.1 and 20 ppm, respectively [4]. Any increase in these concentrations may have contrary effects and plant evolution and growth process. Second type termed non-essential heavy metals, most of environment pollutants are caused by non-essential heavy metals [cadmium (Cd), lead (Pb), mercury (Hg), arsenic (As) and cobalt (Co)] which they are not basic role in any biochemical process. Low concentrations of this metals are toxic to plants [5,6,7]. Environmental pollution with heavy metals is considered more dangerous than other pollutions for the reason that heavy metals cannot be devastated by degradation. [8]. Many factors controlled the toxicity of heavy metals including; each of chemical structure, kind of heavy metal, the dose, the period and the method of contacting of various organisms to heavy metal. In addition, the ability of heavy metals to dissolve even at the lowest concentration in water, the collection capacity in cells, biomagnification through food chain, and the resistance of heavy metal toxicity by breaking it down to non-toxic form. [9].

Bioactive-metals are sub-divided into two groups according to their physicochemical properties, redox-active metals and non-redox metals [10].The redox metals can directly generate oxidative damage, DNA strand breakage, cell homeostasis disruption and injury to photosynthetic pigments and defragmentation of proteins, or cell membrane, which may cause cell death [11,12].Dissimilarity, non-redox active metals indirectly inflict oxidative stress by several mechanisms including binding to sulfhydryl groups of proteins and glutathione reduction, inhibition of anti-oxidative enzymes, or inducing ROS-producing enzymes like NADPH oxidases [13]. physiological and metabolic process of plants change when they are contact to the toxic levels of heavy metals [14]. the indication of heavy metal toxicity appears in plant growth and leaf chlorosis reduction, necrosis, turgor loss, reduction in seed germination and damage in photosynthetic device, all these influences cause the plant death [15]. Remediation processes for removing heavy metals required many techniques and several methods. Phytoremediation technology is one of these techniques, which used to clean the polluted environmental by removing, degrading and/or retrieval of a wide range of heavy metals pollutants. Phytoremediation has six mechanisms include phytoextraction, phytodegradation, Rhizofiltration, Phytostabilisation, Phytovolatilisation, and rhizodegradation, or phytostimulation. [16 ,17]

Zinc is one of the essential trace elements, which falls within the second group of the periodic table. Zinc is considered one of plant micronutrients [18 and 19]. Zinc has an important role in regulating the nitrogen metabolism, auxin synthesis in plants, cell multiplication, and photosynthesis [20]. Lead belongs to group14 of the periodic table, which also includes C, Si, Ge and Sn. Lead has the most metallic characteristics of this group. It has been considered that lead include a non - essential heavy metal for organisms, and it is one of the concern pollutants to the ecosystem [21].Lead contamination to the environments referred to smelting work, application of wastewater therapy to soil, transportation, rain, snow, hail, and others. Ratio of lead, resulting from human activities, reach about 98% [22 and 23]. Heavy metals transfer from plant roots downward to stems, leaves and probably seeds [24 , 25].

Study plants were selected based on their consumption importance by humans. Whereas, they are used on a daily basis in our life, as they include the following:

Cucumber (*Cucumis sativus* L.) is a widely cultivated plant in Cucurbitaceae family. it contains 90 - 95 % water, many nutrients, beside of fibers and vitamins K and D. Cucumber have many of medicinal values, such as to help lower blood pressure, cancer

prevention. According to American Heart Association, cucumber prevent related cardiovascular problems avoid high blood sugar, and support skin healthy. [26]. Tomato (*Lycopersion esculentum* L.) belongs to Solanaceae family and grown nearly all over the world. Tomato grows under high temperature, low range of rain falls, and it is adjustable to different conditions of soil and climate. [27]. Tomato antioxidants were found to get rid of free radicals (lead to cancer, heart disease and premature aging) that can interfere with normal cell growth and activity [28]. Sunflower (*Helianthus annuus* L.) is one of members Asteraceae family, Helianthus genus comprises 65 diverse species [29]. Oil-seed of Sunflower is the world's fourth largest and also used seeds as food and its dried stalk as fuel. It is already been used as ornamental plant [30].

The main objective of this study is to evaluate or measure the ability of plants to remove the lead heavy metal ions from the environments and second aim, to find out which study species (*Cucumis sativus* L. *Lycopersion esculentum* L. or *Helianthus annuus L.*) is resistant and which is sensitive to different types of heavy metal salts (PbCl$_2$, and ZnCl$_2$) by measuring the plants through their physiological processes.

2.Materials and methods:

2. 1. Plant materials: Three seed plants were selected in this study, Tomato (*L. esculentum* L.), Cucumber (*C. sativus* L.) and Sun Flower (*H. annuus* L.) were obtained from the local market, and were used in all experiments for this study.

2.2. Heavy metals: lead (Pb) (non-essential heavy metal) and zinc (Zn) (essential heavy metal) were provided as chloride salts were used in bioassay with the following concentrations: 0, 500, 1000 and 1500 ppm.

2. 3. Germination test: Seeds of the study plant species were selected at similar sizes to avoid any morphological variations. Next, they were sterilized with 5 % Sodium hypochlorite (Clorox) for 3 minutes (frequently used as a disinfectant). Then, the seeds were thoroughly washed with distilled water many times. Petri dishes (9.0 cm in diameter) were cleaned with Clorox and washed by distilled water. Each petri dish was sterilized in an oven at 60 C° and lined with double layers of filter papers (Whitman 9.0 cm in diameter). Used of per treatment (concentration) three replicates were each treatment contains ten seeds Five ml of distilled water and / or solutions was added to be tested for each petri dish of all treatments. They were incubated in an incubator at temperature of 25 ±1. Metal salts and distilled water were added whenever were needed Seeds of the study plants were allowed to germinate for one week. Germination parameters were counted for the calculations of final germination percentages, inhibition of germination percentages, mean germination time, daily germination time, germination index and coefficient velocity of germination.

2.4. Seedling development test: Each germination seeds of different plants used in this study were allowed to grow for a period 14 days to develop into seedlings under the same conditions. At end of growth period for each tested plant seedlings, the following growth parameters were measured, included: seedling height (cm), fresh weight of seedling (g). Seedling were dried in an oven at 80 C^0 for seventy-two hours, and then were weighed in grams using four-decimals balance.

2. 5. Statistical analysis: The data of all experiments were statistically analysed using computer software of Minitab version 19.11. for the determination of the significance within and between treatments. One Way Analysis of variance was used of determine the significance within treatments. Turkey's pairwise comparison tests were carried out to indicate significance between individual means of different treatments used in this research. Analysis of variance was significant and not significant analysis were conducted to determine the relationships between concentration and treatments.

3. Results:

3.1. Effect of zinc chloride on germination parameters of three study plans:

Effect of Zinc chloride on germination parameters of study plants was represented in **Tables (3.1 and 3.2).** According to study results, there was no found significant differences in all germination parameters of cucumber seeds and increased zinc chloride levels caused a significant

decrease in these parameters except inhibition percentages was increased with increasing different concentrations of zinc chloride. Results were observed that, germination parameters (germination percentages, inhibition germination of seeds, germination index and mean daily germination) of Sun flower and Tomato seeds had highly significant under different concentrations of zinc chloride. These parameters were reduced with increasing lead toxicity. Mean germination time and Coefficient of germination velocity of Sun flower and tomato seeds appeared no found significant differences under different concentrations of zinc chloride.

Table 3. 1. Means germination parameters of different study plants under different concentrations of Zinc chloride salts.

Plant	cucumber			
Parameter	In.%	Germ. %	Germ. Index	M DG
Concentration				
0	+ 26.7±27.8	+ 73.3±27.8	+ 24.4±9.3	+ 10.5±3.10
500	30.5±28.4	69.5±28.4	23.14±9.3	9.928±4.7
1000	30.10±31.1	69.5±31.1	22.833±10.4	9.791±4.5
1500	33.8±85.3	66.1±29.7	21.889±9.9	9.385±4.2
Sun flower				
0	*** 0.0^a±0.0	** 100^a±0.1	*** 3.30^a ± 0	*** 14.28^a±0.17
500	6.7^b±9.7	93.3^b±9.6	3.0^a ± 0.3	13.3^b ±1.3
1000	7.0^b±9.2	93^b ±0.1	3.0^a ± 0.3	14.1^{ab} ± 0.2
1500	14.5^c±4.4	85.6^c ±4.3	2.3^b ± 0.14	13.8^c ± 0.5
Tomato				
0	*** 22^a ± 1.5	*** 78.0^a ±15.3	*** 2.7^a±0.5	*** 2.7^a±2.2
500	50.7^b ± 2.5	49.6^b ± 26	1.7^b±0.8	7.1^b±3.6
1000	59^c ± 3.4	41.9^b ±35	1.4^b±1.1	8.3^c±4.9
1500	59.3^c ± 3.0	40.7^c±30.	1.5^b±1.0	7.6^{bc}±4.3

In%: = Inhibition% of seed germination.   Germ%= Germination percent. Germ. Index= Germination. Index.   MDG= Mean daily germination.
+ = Not significant   *** = $P < 0.001$ ± = SEMean   Different letters.

Table3. 2. Means germination parameters of different study plants.

Plants	Cucumber	
Parameters	Mean germination time	Coefficient Velocity
Concentration		
0.0	+ 40.00±0.0	+ 0.25±0.0
500	39.71±0.49	0.25±0.0
1000	39.00±0.0	0.25±0.0
1500	28.28±1.23	0.25±0.0
Sun Flower		
0.0	+ 40.00±0.0	+ 0.25±0.0
500	40.00±0.0	0.25±0.0
1000	40.00±0.0	0.25±0.0
1500	40.00±0.0	0.25±0.0
Tomato		

	+	+
0.0	34.14±4.49	0.23±0.005
500	23.14±5.57	0.21±0.018
1000	22.61±5.52	0.19±0.015
1500	25.14±3.94	0.19±0.004

+ = Not significant.

3. 2. Effects of zinc chloride on fresh and dry parameters of three study plants:
Shoot length under different concentrations of zinc chloride of study plants were calculated (**Fig.3.1**). Results showed that, shoot length of study plant species were reduced with increasing zinc chloride levels in comparison to control.
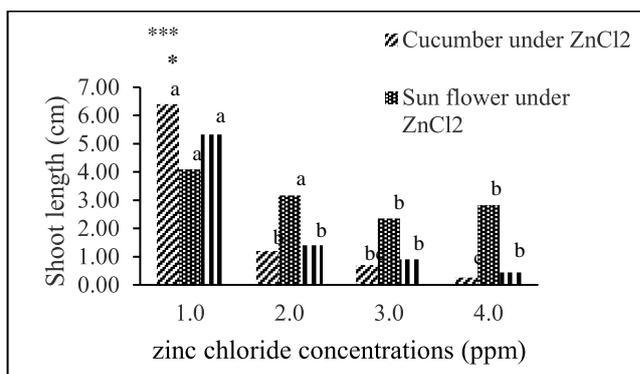

Fig. 3.1. Effect different concentrations of zinc chloride on shoot length of different study plants.
***= $p<0.001$ *= $p<0.05$
Similar letters= Not significant. Different letters= Significant. Bars=SE means.

Results influence of different levels of zinc chloride on root length of study plants were measured in (**Fig. 3.2**). In case cucumber plant, variance analysis of data showed that the zinc chloride concentrations on this parameter were not affect at all concentrations. Root length of sun flower seedlings under zinc chloride were greatly reduced at 1000,1500 and 500 ppm respectively compare with control. The results confirm the root of tomato seedlings were reduced with increased zinc chloride concentrations.
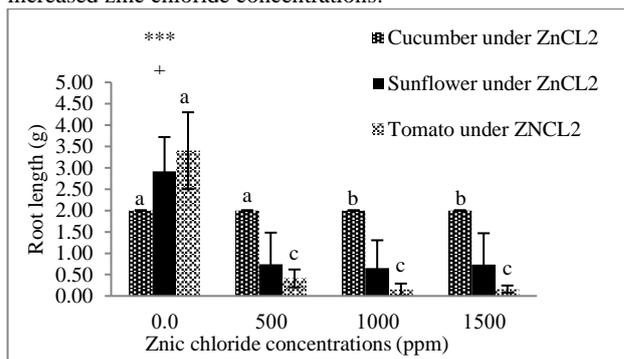

Fig. 3.2. Effect different concentrations of zinc chloride on Root length
of different study plants.
+ = Not significant   ***= $p<0.001$
Similar letters = Not significant.   Different letters= Significant. Bars=SE means.

Fig. 3.3 showed the effect of different concentrations of zinc chloride on fresh weight seedling of three plants study. Fresh weight of cucumber seedling had high averages (0.40 ,0.30) at control and concentrations 1000 ppm and lowest value (0.28) at concentration 500 ppm. Fresh weight of sun flower seedlings not effected with increasing zinc chloride concentrations. In tomato seedlings the results of this study revealed that, fresh weight parameter decreased significantly with increasing zinc chloride levels (500 ppm>1000 ppm
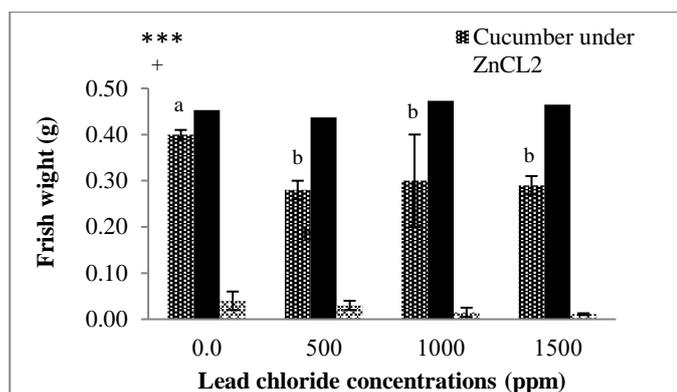
>1500 ppm) as compared to control.

Fig.3.3. Effect different concentrations of zinc chloride on fresh weight of different study plants.

***= $p < 0.001$ + = Not significant

Similar letters = Not significant.   Different letters= Significant. Bars=SE means.

Dry weight of study plant seedlings under different concentrations of zinc chloride were cleared in (**Fig. 3.4**).   Dry weight of cucumber seedling had increased with increasing concentrations zinc chloride up to 500 ppm. While this parameter of sun flower seedlings increased at concentrations 1500, 100 compared with 500 ppm.   Also observed from results, dry weight of tomato seedlings increased with increasing zinc chloride up to 500 ppm as compared by control.
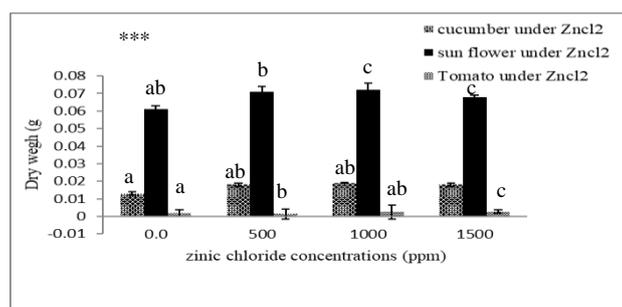

Fig. 3.4. Effect different concentrations of zinc chloride on dry weight of different study plants.

***= $p < 0.001$

Similar letters = Not significant.   Different letters= Significant. Bars=SE means.

3. 3. Effect of Lead chloride on germination measurements of three study plans:

The results effect of different concentrations of lead chloride on germination measurements of study plants were tested in **Tables (3.3 and 3.4)**. The results of this study revealed that, high concentrations of lead chloride reduced of germination percent, germination index and mean daily germination of tomato, cucumber and sun flower seeds respectively. Whereas, germination inhibition percentages increased with increasing these treatments. Coefficient of germination velocity of three study plants not effected under lead chloride levels. There are significant differences of mean daily germination of sun flower and tomato plants between control and other treatments. While this parameter of cucumber plant not effected with increased lead chloride concentrations.

Table 2. 3. Means germination percentages of different plants under different concentrations of lead chloride salts.

Plant	cucumber			
Parameters Concentrations	In.%	Germ. %	Germ. Index	M DG
0	* 21.4ª±24.1	* 98.6ª±3.6	* 3.2ª±0.1	* 14ª ±0.6
500	21.4ª±24.8	78.6ª±4.8	3.3ª±0.2	14.1ª±0.7
1000	51.1ᵇ±23.1	48.9ᵇ±13.1	2.1ᵇ±0.8	13.2ᵇ±3.3
1500	71.8ᶜ±6.0	28.2ᶜ±3.0	2.1ᵇ±0.2	13.2ᵇ±0.9
Sun flower				
0	* 1.43ª±4.2	* 98.6ª±3.6	* 3.2ª±0.1	* 14.1ª±0.6
500	7.1ᵇ±23.05	92.9ª±23.1	3.1ᵇ±0.8	13.2ᵇ±0.6
1000	4.8ᵇ±6.0	87.2ᵇ±6.1	3.2ᵃᵇ±0.2	13.6ᵇ±0.9
1500	12.8ᶜ±4.8	78.2ᶜ±4.8	3.1ᵃᵇ±0.2	13.1ᵇ±0.7
Tomato				
0	*** 24.8ª±27.1	*** 75.2ª±27.1	*** 2.7ª±0.9	*** 10.5ª±3.9
500	44.3ᵇ±13.9	55.7ᵇ±13.9	1.7ᵇ±0.8	9.9ᵇ±4.0
1000	71.4ᶜ±12.9	28.6ᶜ±14.5	1.4ᵇ±0.5	9.8ᵇ±4.6
1500	80.8ᶜ±5.1	19.2ᶜ±5.1	1.3ᵇ±0.2	9.4ᵇ±4.2

In%: = Inhibition% of seed germination.   Germ%: Germination   Germ. Index: Germination. Index.   MDG: Mean daily germination.

+ = Not significant.   * = $P < 0.05$ *** = $P < 0.001$.

Similar letters = Not significant. Different letters= Significant. Bars=SE means.

Table 2. 3. Means germination percentages of different plants under different concentrations of lead chloride salts.

Plants	Cucumber	
Parameters Concentration	Mean germination time	Coefficient Velocity
0.0	+ 39.7±0.5	+ 0.243±0.1
500	39.6±0.4	0.243±0.1
1000	38.9±0.6	0.243±0.2
1500	38.3±1.4	0.240±0.0
Sun Flower		
0.0	* 30.5ª±12.9	+ 0.2±0.0
500	31.1ᵇ±6.3	0.24±0.1
1000	35.2ᵃᵇ±6.7	0.2±0.1
1500	30.4ᵃᵇ±2.1	0.2±0.0
Tomato		
0.0	* 32.9ª±4.1	* 0.3ª ± 0.1
500	31.3ᵇ±6.5	0.2ᵇ ± 0.1
1000	31.2ᵇ±7.3	0.2ᵇ±0.0
1500	29.8ᶜ±7.9	0.2ᵇ ± 0.0

+ = Not significant.   * = $P < 0.05$

Similar letters = Not significant.   Different letters= Significant. Bars=SE means.

3.4. Effect of lead chloride on fresh and dry parameters of three study seedlings:

The data analysis showed that effect of lead chloride on shoot length of tested seedlings were high significant (**Fig.3.5**). Result showed that, increased of concentrations lead chloride reduced in seedling length of three study plants.
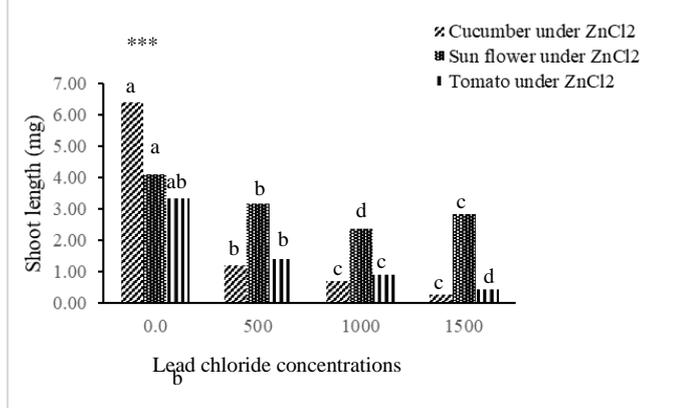
Fig.3.5. Effect of PbCL$_2$ Concentrations on shoot length different plants.
***= $p<0.001$.   Similar letters = Not significant.
Different letters= Significant.   Bars=SE means.

Fig.3.6 showed the influence of various treatments of lead chloride on root length of tested seedling plants. there was highly significant reduction these parameters with increasing different concentrations of lead chloride of tomato, cucumber and sun flower respectively.
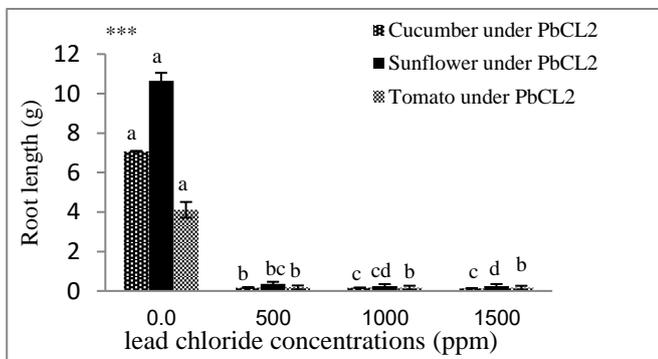

Figure 3.6. Effect of PbCL$_2$ concentrations on root length of different plants**.**
***= $p<0.001$ Similar letters = Not significant.
Different letters= Significant.   Bars=SE means.
Fresh weight of three tested seedlings under different concentrations of lead chloride were calculated (**Fig. 3.7**). The results showed that, increase in various treatment reduced fresh weight of three tested seedlings (tomato>cucumber>sun flower).
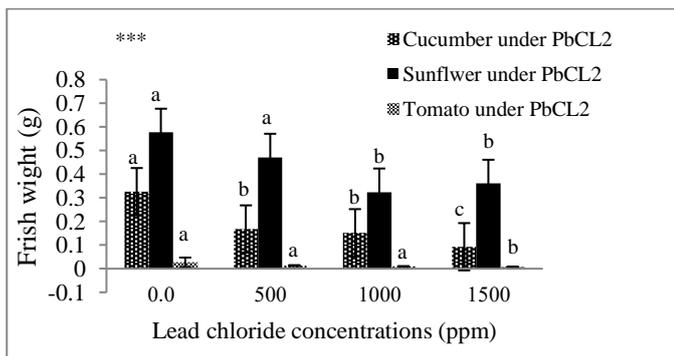

Fig.3.7. Effect of PbCL$_2$ Concentrations on Fresh weight of different study plants**.**
***= $p<0.001$.   Similar letters = Not significant.
 Different letters= Significant.   Bars=SE means.

Dry measurements of different plant species under different concentrations of lead chloride were tested (**Fig. 3.9**). They were observed that increasing lead chloride levels had increased in dry weight of cucumber seedlings, these increased was clear at 1000 and 1500 ppm respectively in comparison to 500 ppm. Effect lead chloride on these parameters were different in sun flower and tomato seedlings, concentrations 1500 and 1000 ppm had highest values compart concentration 500 ppm.
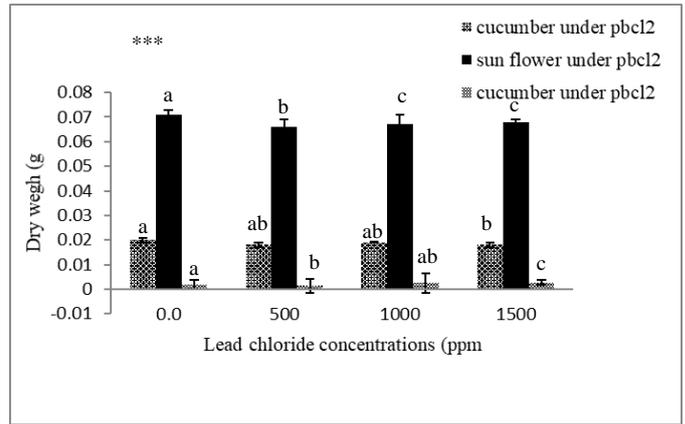

Fig.3.8. Effect of PbCL$_2$ concentrations on dry weight of different plants.
 ***= $p<0.001$ Similar letters = Not significant.   Different letters= Significant.   Bars=SE means

4.Discussion: The response of study plants to Zinc and lead toxicity may diverge from plant to another. Heavy metals toxicity may depend on various factors include plant species and heavy metals concentration in media.   zinc and lead elements were used in this study as chloride salts, they are essential and non-essential element to plants. Besides lead include a non - essential heavy metal, so it has inhibitory effect more pronounced than that zinc chloride. The first plant Sun flower (*H. annuus L.*) signifies the tolerant plant species, because it could growth under high levels of heavy metal environment The second plant species studied was Cucumber (C. *sativus* L) is considered less tolerant to heavy metals toxicity than that sun flower. Tomato plant was very sensitive to different levels of lead and zinc chloride. Reduced germination parameters of test plants induced by excess lead and zinc chloride. Whereas, Tomato were greatly reduced other than sun flower and cucumber plants.   Lead chloride marked more inhibitory effect than zinc chloride. These responses might be related to the lead caused intrusion of lead with the activity of several important enzymes necessary for germination process (protease and amylase enzymes) [31]. Also, the rapid breakdown of stored food material in seeds [32]. Zinc is sessional micronutrient of plants (important component of the enzymes oxidoreductases, transferases, hydrolases, lyases, isomerases, and ligases [33], but high concentrations of this metal may have adverse effects on plant. This effect may be due to oxidative damage of zinc. zinc have reported to cause alternation in catalytic activity of germination enzymes [34]. Similar response was found in maize seeds showed that, soil pollution with zinc reduced maize germination [35]. Jamal *et al.,* reported significant reduced of seed germination of alfalfa seeds due to heavy metals treatments [36].

   Response of fresh and dry parameters of sun flower under different levels of zinc and lead chloride were differently according to the results above mentioned. Shoot and root length measurements of this plants were reduced with increased Zinc chloride levels. Whereas, lead levels up to 500 ppm reduced shoot and root length parameters. Fresh weight not effected under zinc levels and increased at concentration 1000 ppm lead chloride. Measurements of dry weight under ZnCl2 levels were markedly increased under concentrations 1500, 1000 and 500 ppm, while they were increased under 1500 and 1000 ppm PbCl2. In case cucumber seedlings, shoot length parameters increased with increasing of ZnCl$_2$ up to 500 ppm. whereas, root length measurements of seedling not effected under ZnCl$_2$ levels. Lead toxicity reduced both of shoot and root length of seedlings. Fresh parameters reduced under zinc and lead chloride salts. Observed increased of dry weight of cucumber seedling increase with increasing of ZnCl$_2$ levels up to 500 ppm and concentrations 1500 and 1000 ppm Pbcl2. Observed in results this study, shoot and root length of tomato seedlings reduced

with increasing zinc and lead chloride concentrations. Fresh weight of tomato seedlings not effected under different levels of zinc chloride. While in case lead, fresh weight reduced with increased levels. Dry weight of tomato seedling had same effect, where markedly increased at concentrations 1500 and 1000 ppm zinc and lead chloride salts. The results of this study revealed that, effect of lead toxicity on fresh and dry parameters were more pronounced than that zinc toxicity. The effect of heavy metals was more on roots compared to shoots, maybe metals stored primarily in the roots were shoots were less affected. This response may be due to intrusion of Pb with the physiological processes of the plant, as Lead toxicity involves the decrease of enzyme activities, disturbed mineral nutrition, water imbalance, and alteration in hormonal status and difference in membrane permeability [37]. The primary effect of Pb toxicity in plants is a rapid inhibition of root growth, maybe due to the inhibition of cell division in the root tip [38]. Dry weight of Sun flower and cucumber had increased at high concentrations may be refer to heavy metals stress may induced a synthesis of some proteins [39]. Similar effect was found in sunflower, *Vigna radiata* (L.) Wilzeck and black oat reduction of growth due to Cd, Cu and Zn were observed by Gopal and Khurana, Manivasagaperumal, and Abranches [40].

6. conclusion: This study investigates heavy metals uptake (Zn and Pb) by *Cucumis sativus* L., *Lycopersion esculentum* L. and *Helianthus annuus L.* through their physiological and morphological responses. Results this study showed that, effects of heavy metals different with different plant species. This study was affirming existences of high diversity between the responses of the plant species in accumulation of heavy metals, where, the effect of heavy metal salts was more serious on Tomato (*Lycopersion esculentum* L.) plants and cucumber (*Cucumis sativus* L.) while Sun flower (*Helianthus annuus L.*) showed toleration to these compounds. We can conclude that *Helianthus annuus L.* (Sun flower) plant may be able to accumulate high concentrations of heavy metals, i.e. the results indicate that the hyperaccumulation criterion was fulfilled by *Helianthus annuus L.* (Sun flower) species in the case of heavy metal salts used in this research.

7.Recommendation: 1. Quantities determination of heavy metals in studied plant tissues by using atomic absorption spectrometry (AAS). 2. The study of the plant components induced by heavy metals stress, for example, stress proteins (proline), measurements of pigment contents and the process of photosynthesis in the plant species used in this research under the effect of the heavy metals used in this research**.** 3. effect study of ion toxicity on plant development

References:

[1]- Morsy A. A.; Salama, K. H. A; Kamel, H.A., and Mansour, M. M. F. (2012). Effect of heavy metals on plasma membrane lipids and antioxidant enzymes of Zygophyllum species Eurasia J Biosc. i., **6**:1-10.

[2]- Sebastiani, I., Scebba, F. and Tongttti, R. (2004). Heavy metal accumulation and growth responses in poplar clones Eridano (Populous deltoides × maximowiczii) and I-214 (P.× euramericana) exposed to industrial waste. Environmental and Experimental Botany.. **52**,79-86.

[3]- Rai, V., Vaypaycc , P., Singh, S. N. and Mchrotra, S. (2004). Effect of chromium accumulation on photosynthetic pigments, oxidative stress defense system, nitrate reduction, proline level and eugenol content of Ocimum tenuifiorum. Plant Science.**167**,1159-1164.

[4]- Yay, O.D., Alagha, O., and Tuncel, G. (2008). Multivariate statistics to investigate metal contamination in surface soil, Environ. Manage. **86**,581-594.

[5]- Zing and Jinglu, Wu. J. (2013). Heavy metal pollution of lakes along the mid-lower reaches of the Yangtze River in China: intensity, sources and spatial patterns. Int. J. Environ. Res. Public Health. **10**,793-807.

[6]- Yan, X., Gao, D., Zeng. C., Xiang, W., and Zhang. M.(2013). Relationships between heavy metal concentrations in roadside topsoil and distance to road edge based on field observations in the Qinghai-Tibet plateau, China. Int. J. Environ. Res. Public Health.**10**, 762-775.

[7]- Yan, X., Zhang, F., Zeng. C., Zhang. M., Devkota, L.P., and Yau,T.(2012). Relationship between heavy metal concentration in soils and grasses of roadside farmland in Nepal. Int, J. Environ. Res. Public Health. **9**,3209-3226.

[8]- Zhang, F., Yan, X., Zeng. C., Zhang. M., Shrestha. S., Devkota. L.P., and Yao T. (2012). Influence of traffic activity on heavy metal concentrations of roadside farmland soil in mountainous areas. Int, J. Environ. Res. Public Health. **9**:17715-1731.

[9]- Ramay, A., and Carter, G.(2012). Geostatistical Geochemical and SWIR-ASTE Analyses, twin Glacier property, northwester British Columbia, P.41.

[10]- Biwe, E. R., Status. (2012), distribution of available micronutrients along a toposequence at Gubi Bauchi North Eastem Nigeria. Interactional Research Journal of Agricultural Science and soil Science. **2** (10), 436-439.

[11]- Olukanni, D. O., and Adeoye, D.O. (**2012**), Heavy metal concentrations in Road Side Soils from Selected Locations in the Lagos Metropolis, Nigeria. International Journal of Engineering and Technology. **2**, (10), 1743-1751.

[12]- Parveen, N., Ghaffar, A. S. Shirazi, S. A. and Bhalli, M. N. (**2012**), Spatial Distribution of Heavy Metals Contamination In Road Side Soils of Faisal a bad- Pakistan Journal of Science. **64**, 4309-315.

[13]- Mmolawa, K. B., Likuku, A. S. and Gapoutloeloe, G. K. (2011), Assessment of heavy metals pollution in soils alony major roadside areas in Botswana. African Journal of Environment Science and Technology. **5**(3),186-196.

[14]- Jamil, S., Abhilash, P.C. Singh, A., Singh, N., and Behl, H. M., (2009) , "Fly Ash Trapping and Metal Accumulating Capac- ity of plants In plication for Green Belt around Thermal power plants, " Landscape and Urban planning, **92**, 2 , 136-147.

[15]- kabata- pendies, A. (2001), Trace elements in soils and plants (3rd . ed). Boce Raton: CBC**.**

[16]- Garba, S. T. L. Ahmed, J.C. Akan, and B. A. Dauda, (2014), Distribution pattern of the Heavy Metals: Pb, Zn, Cd and Cu in roadside soils of Maiduguri Metropolis, Bomo State Nigeria. International Research Joumal of pure & Applied Chemistry. **4** (5), 486- 493.

[17]- Ekere. N. R, and O.P. Ukoha, (**2013**), Heavy metals in street soil dusts of industrial marker in Enugu, South East, Nigeria. Intemationl Journal of physical Sciences **8**(4), 175-178

[18]- Abchi, E. S., Okunola, O.J ., Zubairu, S.M.J., Usman, A.A., and E Apene, (2010), Evaluation of heavy metals in roadside soils of major streets in Jos metropolis, Nigeria- Journal of Environmental chemistry and Ecotoxicology. **2**(6), 98-102.

[19]- Olukanni. D. O, and Adebiyi, S.A ., (2012),"Assessment of vehicular pollution of road side soils in Ota Metropolis, Ogun State, Nigeria". UCEE-UENS. **12** ,4 40-46.

[20]- U.S. EPA. (1996), Distribution of soil lead in the Nation´s Housing stock. EPA., 747-R96-002, 5-7 .

[21]- Jozefczak, M., Remans, T., Vangronsveld, J. and Cuypers, A. (2012), "Glutathions is a key player in metal-induced oxidative stress defenses," international *Journal of Molecular Sciences*, **13**,(3), 3145-3175.

[22]- Flora, S. J. S., (2009), "structural, chemical and biological aspects of antioxidants for strategies againt metal and metalloid expo-sure," Oxidative Medicine and cellular longevity,2, 4, 191-206.

[23]- Bielen, A., Remans, T., Vangronsveld, J., and Cuypers, A., (2013), "The influence of metal stress on the availability and redox stats of ascorbate, and possible interference with its cellular functions, "International Journal of Molecular Sciences,14,3,6382-6413.

[24]- Seghatoleslami, M. J., Bradaran, R., Ansarinia, E.& Mousavi, S. G.(2012) Effect of irrigation and nitrogen level on yield, yield components and some morphological traits of sunflower. Pak J Bot. **44**(5), 1551-162.

[25]- Harter, A. V., Gardner, K. A., Falush, D., Lentz, D. L., Bye, R. A.& Rieseberg. L. H. (2004), Origin of extant domesticated sunflower in eastern North America. Noature,430(69996), 201-205.

[26]- Muller, M. H., Latreille, M.& Tollon, C. (2011), The origin and evolution of a recent agricultural weed: population genetic diversity of weedy populations of sunflower (Helianthus annuus L.) in Spain and France. Evol Appl., **4** (3): 499-514.

[27]- Rastegar, Z., Sedghi, M., and Khomari, S. (2011), Effects of accelerated aging on soybean seed germination indexes at laboratory conditions, Notulae Scientia Biologicae, 3(3),126-129.

[28]- Ellis, R. H. and E. H. Roberts. (1981), The quantification of ageing and survival in orthodox seeds. Seed sci. Tech., **9**, 373-409.

[29]- Gairola, K. C., Nautiyal, A. R. and Dwivedi. A. K. (2011), Effect of temperatures and germination media on seed germination of Jatropha Curcas Linn., **2** (2): 66-71.

[30]- Gary D. Christian. Analytical chemistry. (1994), Fifth edition. United states of America.

[31]- Farooqi, Z., Iqbal, M., Kabir, M. andShafiq, M. (2009), Toxic effect of lead and cadmium on germination and seedling growth of *Albezia lebbeck* (L.) Benth. Pak. J. Bot. **41**,27-33.

[32]- Gopal R and Khurana N. (2011), Effect of heavy metal pollutants on sunflower. African J. of Plant Sci. 5(9), 531-536

[33]- Salat, D.E., Prince, R.C., Pickering, I.J., and Raskin, I. I. (1995), Mechanisms of cadmium mobility and accumulation in Indian mustard, *Plant Physiology.* **109**, 1427 – 1433.

[34]- Barak, P., and Helmke, P.A. (1993), The chemistry of Zn. In: Robson AD, ed.Zn in Soils and Plants. Developments in Plants and Soils Sciences. Dordrecht, the Netherlands: Kluwer Academic Publishers. 55,1 – 13.

[35]- AN Y. J.(2004). Soil ecotoxicity assessment using cadmium sensitive plants. Environ. Pollut. 127, 21,

[36]- Jamal, S.N., Iqbal, M.Z., and Athar, M. (2006). Effect of aluminum andchromium on the growth and germination of mesquite (*Prosopis juliflora* (Swartz.) DC). *Internat. J. Environ. Sci. Technol.* **3**, 173 - 176.

[37]- Sharma, P. and Dubey, R. (2005). Lead toxity in plants. Braz. J. Plant Physiol. **17**, 35-52.

[38]- Eun, S., Youn, H. and Lee, Y.(2000). Lead disturbs microtubule organization in the root meristem of *Zea mays*.Physiol. Plant.**44**,5-9

[39]- Mahmood, S., Hussain, A., Saeed, Z., and Athar, M. (2005). Germination and seedling growth of corn (*Zea mays* L.) under varying levels of copper and zinc. *International Journal Environmental Science and Technology*., **2**, 269 -274.

[40]- Manivasagaperumal, R Vijayarengan P Balamurugan S and Thiyagarajan G. (2011). Effect of copper on growth, dry matter yield and nutrient content of vigna radiata (l) Wilczek. J. Phytology,**3**(3), 53-62