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Assessment of the potential of *Prosopis cineraria* seedlings in uptake of lead and zinc

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ABSTRACT

In order to investigate the tolerance and impacts of Pb and Zn absorption on P. cineraria 4-month-old seedlings were exposed to $Pb(NO_3)_2$ (in five different concentrations: 0, 50, 250, 500 and 1000 (mg/ L) and $ZnSO_4$ (in 4 different concentrations: 0, 50, 250 and 500 (mg/L) for 45 days. Then, the samples were harvested and some morphological attributes and bioaccumulations of Pb^{2+} and Zn^{2+}in different plant tissues were assessed. Results for Pb showed that some attributes were affected by Pb. Morphological symptoms of Pb effects on the leaf were appeared with thin, yellow and brown spots on the leaf in high concentration (1000 mg/L) and more than 70% of total accumulated Pb (2518 mg/kg) were accumulated root tissues. Results for zinc indicated that most of attributes were affected by Zn. Morphological symptoms of Zn effects were observed with decreasing in root diameter, height and biomass in high concentration (500 mg/L) and almost 80% of Zn (3046/2mg/kg) was accumulated in root tissues. With respect to bioaccumulation factor, transfer factor and a strong root system, A. victoriae can be suggested as Pb and Zn stabilizing and according amount of accumulated Pb in above ground parts in high concentration (1000 mg/L) can be considered as Pb hyperaccumulators species. Therefore, A. victoriae can be used as a suitable species for remediation of Pb and Zn contaminated areas after complementary studies.

Key words: Bioconcentration factor, Hyper accumulator, Morphological traits, Phytoremediation, Translocation factor.

INTRODUCTION

Today, different resources pollution to heavy metals is one of the most important environmental problems. In order to reduce pollution of inorganic contaminants and heavy metals, chemical and physical methods used, but unfortunately most of these methods are expensive and causes soil degradation and the environment [23]. In recent years, in the field of phytoremediation technology, from green plants and their relationship with soil microorganisms to reduce pollution of various sources in the environment was used, which this method is eco-friendly and affordable and does not require expert forces and improves habitat, removal of environmental pollution, maintaining biological activity and the physical structure of the soil [17], Singh et al [23]. Species 450-400 known so far have accumulated great ability for growth in the contaminated soil and families are: Wallflower, cereal, Euphorbia, chicory, mint and legumes [12].

Heavy metals of Pb and Zn are among the most important. Normal amount of Pb in soil is 15 mg/kg, but this amount in non-contaminated acidic soils contaminated soil to 40-10 and contaminated soils more than 100 mg/kg [24]. In some studies, the concentration of Pb, 1,000 times more than normal range it's reported [17]. This element is non bio-degradable and tends to accumulate in biological systems, but had not significant impact in the plants' physiological responses, and due to chemical similarity to the essential elements, There is the possibility of attracting the plant [9], As well as undesirable effects on seed germination, plant growth and photosynthesis which causes reduce plant height, moist and dry weight and biomass production, preventing the synthesis of chlorophyll, poisoning and impaired metabolism of the plant, reduce the absorption of minerals and plant function, loss of product quality and biological activity which increase soil fertility [6]. In the case of Zn, the total amount of it's in soil is 50 mg/kg, and in soils contaminated is to more than 70 mg/kg. Induced toxicity of Zn in leaf of plants, usually appearing in higher concentration of 100 mg/kg [4]. It is an important factor in plant nutrition and enzymatic activities (due to high mobility easily absorbed by the roots of plants), as well as protein synthesis processes of chloroplasts and plant growth hormones are affected [6]. Element Zn is known an essential micronutrient for plant growth and development, but in high concentrations, because of replacement by essential elements, had negative effect on yield and food production plants, as well as this metal is completely soluble in slightly acidic soils and too much application of phosphate fertilizers in agriculture is an factors increase it's in soil [6], [25].

Various studies on the effects of Pb and Zn on the trees had been conducted. In a study about the sorption of Pb and Zn in mangrove trees (Avicennia marina L), it was found that high concentrations of these metals accumulate in the root cell walls that limited the transfer of Pb and Zn to plant aerial parts [11]. By studying the absorption of Pb and Zn by trees of Fraxinus (Fraxinus excelsior L.), acacia (Robinia pseudo acacia L.), poplar (Populous alba L.), Acer (Acer pseudo-platanus L.) and Alnus (Alnus glotinosa L.) revealed that the this metals were accumulated in aerial parts and poplar highest amount of Pb and Zn store in their leaf and had the highest rate of growth in contrast to other species [15]. In a study in the mangrove forest (Avicennia marina L.) the accumulation of Pb and Zn was investigated and it was found that Zn in fruit and Zn in roots was collected and the amount of Zn was (6.20 mg/kg) more than of Pb that is a reason for micronutrient of Zn element [18]. In a study on annual seedlings of Acacia victoriae L. results demonstrated that this plant is one species of concentrations of Pb and storage highest and lowest of Pb is in roots (3580 mg/kg) and leaf (650 mg/kg) occurs, respectively [12].

P. cineraria tree of the legume family (Mimosoideae), which as a stabilizing of the dune and also used to develop suburban green spaces and protective coating around of farms. *P. cineraria* had particularly important in the process of soil reform with nodules of their roots that cause nitrogen fixation and subsequent increase soil fertility. The reason for choosing *P. cineraria* high capacity to adapt to with extreme environmental conditions in order to the cultivation and revive those [12].The aim of this study was evaluate the resistance of *P. cineraria* 4-month-old seedlings to Pb and Zn metals and impact of them on some morphological characteristics of *P. cineraria*, the accumulation amount of metals in the plant organs as well as investigate the potential use of the plant in phytoremediation technology.

EXPERIMENTAL SECTION

The *P. cineraria* seeds in plastic pots (20 cm in height and 15 cm in diameter) with a capacity of 5.2 kg dry soil of farm in a ratio of 2:1:1 (dried animal manure, sand-gravel, soil) with textured of silt - loamy all pots were planted. Some soil physical and chemical properties used, are presented in Table 1. Also, watering pots took place, on the basis of 60% of field capacity calculated. After 4 months, the pots were transferred to the environment and fifteen pots in five concentrations of 0, 50, 250 and 500 by zinc sulfate solution for a completely randomized design were treated for 45 days. Because the all the pots were the same age (4 months) tried pots had lowest difference in terms of height, Succulence, leaf number, etc. to be selected for treatment. Control samples (zero dose) during this period were irrigated with water only and no metal was not added to them. After the end treatment, the of plant morphology traits such as leaf number and height of the root, stem and total plant, collar diameter (using a digital caliper 15 cm with the accuracy of 0/001 mm) was calculated. Moist and dry weight the different plant parts (Liu et al., 2008), Plant tolerance the index (the ratio of treatment root length to control treatment) [13], and inhibition size index of plant growth (dry weight control treatment minus the dry weight of treatment divided on dry weight of control treatment) [12], Bioaccumulation coefficient (the amount of metal in the organs (aerial and underground) to the amount of metal induced into the soil) [13], Enrichment coefficient (the amount of metal induced into the soil to amount metal concentration in the aerial organs) [28], Transfer factor (the amount of metal concentration in aerial organs (leaf and stems) to amount of metal concentration in the plant underground organs) [12], In addition, the concentration ratio of metals (Pb and Zn) stem to Root (S/R) leave to root (L/R) and leaf to stem (L/S) was calculated until *P. cineraria* ability in transfer metal to different organs examined. Uptake Index (result multiplying the weight of dry matter × concentration of the element in the aerial organs) were measured. After harvest, leaf, stems and roots were separated and washed and after measure the weight of the samples, samples were in the oven at 70 ° for 48 hours to dry, then were measured with a digital scale with accuracy 0/001. Next, 0/1 grams of powder samples of each organ, the ratio of 1: 2: 8 with 65% nitric acid, sulfuric acid and perchloric acid were digested [16]. Finally, the concentration of Pb and Zn by atomic absorption spectrometer CTA-2000 AAS model was read. Statistical analysis of measurement characteristics with using SPSS software was performed. ANOVA test and means comparison was done by LSD at 5% level and drawing of graphs was used Excel software.

RESULTS AND DISCUSSION

- Analysis of variance and how respond seedlings to Pb

The results of variance analysis Pb metal revealed that characters: stem length, plant height, collar diameter, leaf number, inhibition size index of plant growth, moist weight of leave, stem and total, dry weight of stem and total, amount of absorption in organs, transfer agent, absorption Index, bioaccumulation coefficient (underground and aerial) and enrichment was significant at ($P<0.05$), (Tables 2 and 3). Results of the average comparison traits evaluated Pb metal (Table 4 and 5), showed that the plant total height in concentrations of 250, 500 and 1000 mg/l and stem length at concentrations of 500 and 1000 mg/l had significant difference with the control treatment (an increase of 25% at concentration of 500 mg/l, compared to the control) that shows the effect of Pb nitrate on plant growth. But wasn't observed significant difference for root length in all concentrations. Thus increase concentration of Pb was effective on total height. Collar Diameter at concentrations of 250, 500 and 1000 mg/l had significant difference with the control treatment and with increasing concentration of Pb, collar diameter increased (increase of 80% at concentration of 500 mg/l, compared to the control treatment). Difference was significant for average number of plant leaf in the concentration of 1000 mg/l, so that in concentration of 1000 mg/l were significantly lower number of leaf. Moist weight of leave in treatments of 250, 500 and 1000 mg/l and stem moist and total weight in two concentration of 250 and 500 mg/l had significantly different with the control treatment, but weren't exits significant differences in root moist weight for all treatments. Results founded for stem, root and total dry weight conformed with results obtained for stem, root and total moist weight, so that stem and total dry weight in concentrations of 250 and 500 mg/l had significantly different with control treatment (with increase concentration the amount of dry weight was added). Increase 80% of total moist weight and 95% of total dry weight at 500 mg/l compared to the control treatment, but at root dry weight, significant difference wasnot seen with the control treatment. Different wasn't significant for Tolerance Index (based on root length control and treatment) at different concentrations of Pb, In case that inhibition size index of plant growth (indicating severe stress on the plant) in all concentrations of Pb had significant difference with the control. Decreased tolerance index and increased inhibition size index of plant growth at concentrations of Pb high reflects the negative impact of Pb on the strength of *P. cineraria* (Table 4). The amount of lead absorbed by the roots and stems at all levels of 50, 250, 500 and 1000 mg/l and leaf uptake at concentrations of 500 and 1000 mg/l with control treatment showed significant difference. Leaf and stem concentration ratio to Pb root (L/R, S/R) decreased with increasing concentrations of Pb, but the concentration ratio of leaf to stem (L/S) increased and significant difference between treatments in the concentration ratio (L/R, L/S) was found. Bioaccumulation coefficient (amount of absorption in the organs to the amount of solution incoming to the soil) shows that in all experiments the coefficient is greater than one (coefficient>1) (Average Bioaccumulation coefficient of aerial parts: 3/1 (dimensionless)).

Table 1. Some physical and chemical properties of the soil samples used

soil texture			Na (mg/kg)	K (mg/kg)	Organic carbon (%)	Total nitrogen (%)	EC (ds/m)	pH
Clay	Silt	Sand						
6	55	39	11	42	1/33	0/163	3/6	7/1

Table 2. Analysis of variance of morphological attributes evaluated at investigate the amount of Pb absorbed by *P. cineraria* 4-month-old seedlings

Source of variation	DF	Mean Square														
		RL	SL	PL	D	LN	LMW	SMW	RMW	TMW	LDW	SDW	RDW	TDW	TI	GGI
Treatment	4	ns	**	**	*	*	*	**	ns	**	ns	*	ns	*	ns	**
Error	10	17/93	9/97	11/92	0/08	370/35	0/363	0/76	0/052	0/79	0/103	0/032	0/013	0/2	431/4	0/012

***, *different was Significant at (P<1%) and (P<5%) respectively, and ns means different wasn't Significant.*

Transfer agent (the amount of contaminant transport from root to aerial parts) in all treatments is smaller than one (average of its 0/52 mg/kg), which represents the accumulation of Pb in the roots of this specie. Enrichment coefficient (the amount of metal into the soil to the metal concentration of aerial organs) with increased pollutant concentrations increased, and all treatments were significantly different from each other, which shows with increase in the concentration of Pb, Its value was increased in aerial organs. Absorption Index (dry matter weight × amount of element concentration in aerial organs) reflects the impact of amount of Pb absorption on the plant biomass which in the treatment of 50 mg/l is significantly different from other treatments.

Table 3. Analysis of variance absorption amount, transmission ratio, absorption coefficient and transfer of Pb by *P. cineraria* 4-month-old seedlings

Source of variation	DF	Mean Square										
		Leaf	Stem	Root	S/R	L/R	L/S	TF	UI	EC	BCF(root)	BCF(air)
Treatment	4	**	**	**	**	**	**	**	**	**	**	**
Error	10	1505/3	2743	83186/4	0/003	0/002	0/01	0/003	122702/1	0/112	0/38	0/29

***, Different was Significant at (P<1%).*

Table 4. Compare the average morphology adjectives evaluated at investigate the amount of Pb absorbed by *P. cineraria* 4-month-old seedlings (Treatments based on mg/l)

Treatment	Attribute evaluated									
	SL(cm)	PL(cm)	D(cm)	LN	LMW(gr)	SMW(gr)	TMW(gr)	SDW(gr)	TDW(gr)	GGI
control	21±2/5a	41±1a	1/22±0/1a	45/6±21/4a	1/18±0/44a	0/7±0/41a	2/2±1/03a	0/32±0/27a	1/02±0/4a	0/2±0/1a
50	20±1ab	36±2/5ab	1/48±0/25ab	15±12/6ab	1/11±-/96ab	0/47±0/28ab	1/7±1/3ab	0/31±0/13ab	0/89±0/32ab	0/22±0/13b
250	26/3±4/4ac	53±5/1c	2/2±0/6c	52/3±12ac	2/13±0/54c	1/4±0/11c	4/17±0/77c	0/69±0/13d	1/8±0/7c	-0/22±0/12c
500	26/7±3/5cd	49±36cd	2/3±0/15cd	51/68±31/3acd	2/01±0/44cd	1/5±0/13cd	4/01±0/62d	0/68±0/12d	1/88±0/3d	-0/01±0/03d
1000	30/7±1/2cde	51±1/8ce	1/68±0/17cde	4/29±4/7cde	0/45±0/4e	0/46±0/4e	1/71±0/23abe	0/56±0/11de	1/14±0/4be	0/02±0/12de

Exit a similar symptom, showing no significant difference between treatments (P<5%).

Table 5. Compare the average absorption amount, transmission ratio, absorption coefficient and transfer of Pb by *P. cineraria* 4-month-old seedlings (Treatments based on mg/l).

Treatment	Attribute evaluated									
	Leaf	Stem	Root	S/R	L/R	L/S	TF	UI	EC	BCF (root)	BCF(air)
control	-	-	-	-	-	-	-	-	-	-	-
50	120±7/2a	232±51/4a	609±20/6a	0/32±0/03ab	0/99±0/02a	0/52±0/076b	0/56±0/06ab	340/7±143/2d	0/05±/1a	11/4±1/04a	7/3±1/2a
250	183±51/1a	333±49/7b	106±62/5b	0/29±0/02bc	0/17±0/05a	0/55±0/2bc	0/51±0/04bc	989/5±347/7c	0/14±0/1b	4/02±0/23bc	2/1±0/16bc
500	64/2b	540/±63/2c	1765±201/2c	0/29±0/02bc	0/16±0/01a	0/52±0/05b	0/52±0/02ab	1622/2±33/1a	0/22±0/03c	3/1±0/65cd	1/69±0/22cd
1000	382±30/1c	655±64/3d	2512±335/2d	0/26±0/02bc	0/14±0/03a	0/57±0/04a	0/4±0/02bc	1211±432/2b	0/29±0/02d	2/4±0/32cd	1/03±0/05cd

Exit a similar symptom, showing no significant difference between treatments (P<5%).

Table 6. Analysis of variance of morphological attributes evaluated at investigate the amount of Zn absorbed by *P. cineraria* 4-month-old seedlings

Source of variation	DF	Mean Square														
		RL	SL	PL	D	LN	LMW	SMW	RMW	TMW	LDW	SDW	RDW	TDW	TI	GGI
Treatment	3	**	*	**	*	*	*	*	**	**	*	**	*	**	**	**
Error	8	16/4	11	32/67	0/106	139	0/221	0/211	0/112	0/47	0/097	0/133	0/124	0/51	54/67	0/002

***, * different was Significant at (P<1%) and (P<5%) respectively.*

- Analysis of variance and how respond seedlings to Zn

The results of analysis of variance for Zn showed that different for stem, root and total height of plant, moist and dry weight of plant, collar diameter, leaf number, tolerance values, inhibition size index of plant growth, amount of absorption in organs, transfer agent, absorption Index, bioaccumulation coefficient (underground and aerial) and enrichment was significant at the 5% level (P <0/05) (tables 6 &7). The results of comparison of averages of evaluation characteristics Zn (Tables 8 and 9) show that all morphological traits studied at concentration of 500 mg/l, with other treatment had significant differences. Therefore concentration of 500 mg/l Zn have negative impact on growth, yield and plant biomass. It can be concluded that reducing the tolerance index and increase Inhibition size index of plant growth at high concentrations reflects the negative impact Zn on the tolerance value of this specie. Amount of Adsorption Zn in the leaf, stems and roots in all three concentrations were significantly different with control treatment. Investigate ratio of the Zn concentration of the stem to the roots, leaf to roots and stems to leaf (S/R, L/R, and L/S) shows that by increasing Zn concentration the amount of transmission is reduced and there significant differences between ratios (S/R, L/R) at 500 mg/l. Bioaccumulation coefficient was greater than one at all concentrations (average of bioaccumulation coefficient of root and aerial organs is 6/03 and 2/48 respectively, (dimensionless)) and different for bioaccumulation coefficient of root in all treatment with each other was significant. Also transfer agent at all concentrations is less than one (average it's 0/41 mg/kg), which represents the accumulation of Zn in Roots of this specie and demonstrated that different for treatment of 500 mg/l from other treatments was significantly. Enrichment coefficient in all treatments was significantly different that indicated that Zn Accumulation in aerial organs have correlation with increase of concentrations in the soil. Absorption Index at concentration of 500 mg/l decrease that reflects the negative impact Zn on plant biomass (Table 9).

Table 7. Analysis of variance absorption amount, transmission ratio, absorption coefficient and transfer of Zn by *P. cineraria* 4-month-old seedlings

Source of variation	DF	Mean Square										
		Leaf	Stem	Root	S/R	L/R	L/S	TF	UI	EC	BCF(root)	BCF(air)
Treatment	3	**	*	**	*	**	**	*	**	**	**	*
Error	8	522/13	4200/76	43700/12	0/002	0/002	0/03	0/003	131000/91	0/00	0/022	0/662

***, different was Significant at (P<1%).*

Table 8. Compare the average morphology adjectives evaluated at investigate the amount of Zn absorbed by *P. cineraria* 4-month-old seedlings (Treatments based on mg/l)

Treatment	Attribute evaluated														
	RL	SL	PL	D	LN	LMW	SMW	RMW	TMW	LDW	SDW	RDW	TDW	TI	GGI
control	32±5/4a	33±1a	65±5/1a	2/2±0/4a	140±11/2a	2/3±0/4a	2/2±0/4a	2/2±0/4a	9/7±0/5a	1/6±0/2a	1/8±0/1a	1/4±0/2a	4/4±0/1a	99/4±0a	0/1±0a
50	36±1/9a	37±4/9a	73±6a	2/5±0/1a	129±3a	2/5±0/1a	2/5±0/1a	2/5±0/1a	9/4±0/4ab	1/9±0/0/3a	2/2±0/5a	1/6±0/4a	5/2±1/1a	109±6/5a	-0/03±0/04a
250	38±1/4a	40±1a	75±1a	2/7±0/1a	121±8/9a	2/9±0/1a	2/7±0/1a	2/7±0/1a	10/2±0/5b	2±0/3a	2/1±0/3a	2/1±0/4a	5/6±0/3a	112/3±6/4a	-0/03±0/02a
500	24±2/4b	24±3/2b	48±5/1b	1/6±0/3b	94±12/8b	1/5±0/3b	1/6±0/3b	1/6±0/3b	7/2±0/3c	1±0/2b	1/3±0/3b	1±0/2b	2/9±0/3b	72/1±9/2b	0/08±0/1b

Exit a similar symptom, showing no significant difference between treatments (P<5%).

Table 9. Compare the average absorption amount, transmission ratio, absorption coefficient and transfer of Zn by *P. cineraria* 4-month-old seedlings (Treatments based on mg/l)

Treatment	Attribute evaluated										
	Leaf	Stem	Root	S/R	L/R	L/S	TF	UI	EC	BCF(root)	BCF(air)
control	-	-	-	-	-	-	-	-	-	-	-
50	81/3±6/3a	123±16/3a	425/1±73/7a	0/3±0/2a	0/2±0/03a	0/67±0/13a	0/4±0/11a	1203/4±201/5b	0/07±0/2c	7/3±1/3a	3/9±0/15a
250	159±27/4b	240/6±2/4b	840±110/9b	0/26±0/02a	0/18±0/25a	0/65±0/17a	0/43±0/03a	2587/2±430/3a	0/3±0/025a	3/3±0/4c	1/59±0/3b
500	249/2±30/6c	529/2±125/1c	3040±390/1c	0/16±0/05b	0/07±0/01b	0/60±0/12a	0/22±0/07b	2370±530/1a	0/12±0/011b	5/9±0/7b	1/57±0/3b

Exit a similar symptom, showing no significant difference between treatments (P<5%).

CONCLUSION

- Effects Pb and Zn on production of seedlings biomass

Reduce the growth, the reaction of a wide range of plants in laden soils with heavy metals. This growth Reduce in plants could reduce root biomass that with severity of it, the total biomass production in plants is low. This Reduce the growth may be due to metal toxicity contrast with plant nutrients and prevent root penetration in the soil [2].The results this study showed that the biomass of *P. cineraria* as indicator growth performance, at lower concentrations (prior to 1000 mg/l of Pb and 500 mg/l Zn) not only did not decrease, but also this heavy metals had positive impact on seedlings growth compared to the control samples. This stimulates the growth may be due to high resistance of *P. cineraria* against relatively high concentrations of Pb, Zn or nitrogen that exist in Pb salt Cause the increased plant biomass growth [2], [12]. Studies such as [2], Kadukova et al [8], Mahdavi et al [12] reported that low-level Pb caused the growing and production of more biomass than the control plants. However, high concentrations of Pb in *P. cineraria* had negative effect on total dry biomass of plant which confirms the findings Mahdavi et al [12]. Maldonado et al [13] and 2011. Also The reduction total dry biomass of plant at high concentrations of Zn compatible with findings Judith et al [7] and Sagardoy et al [21].

- Effects Pb and Zn on the growth characteristics of length and seedlings root

Inhibits of root growth is One of the primary effects of Pb toxicity [12], but the results showed that Pb did not have a significant effect on root length that this findings was confirmed by results of [20]. Root length decreased in high concentration Zn that this findings was confirmed by results of Brown and Wilkins [3]. However, Reduce the length of root by reducing total height of plants was associated. Reduce the total length of plant in high concentration Zn by results of Judith et al [7], Sagardoy et al [21], And Tang et al [25] and also at high concentrations Pb by results Mahdavi et al [12], Maldonado et al [13] And Mukhtar et al [17], was confirmed. This reduce the total height may be due to reduced root growth and water transfer and nutrients to the aerial organs [12]. Also, in high concentrations of Pb, increase of plant height was observed that was confirmed by Wang et al [26].

- The toxicity of Pb and Zn on *P. cineraria* seedlings

Zn is an essential ingredient for plants and its toxicity threshold according to species, time of exposure to stress by Zn and composition of nutrients in growth environment is different [22]. According to the researchers, the first signs of Zn toxicity in plants yellowing young leaf [5], but results of this study showed that there was no sign of Zn toxicity on leaf of *P. cineraria* , as well as don't have serious damage on the plant so *P. cineraria* have large concentration tolerance capacity of Zn. But morphology symptoms of effect by reducing collar diameter, height and reduce 55% of the total dry weight of the biomass plant at concentration of 500 mg/l compared with control seedlings were found, that this results with the findings of Marchiol et al [14] is consistent. Finally, the index reduction the value of plant tolerance with research results Mahdavi et al [12], Wang et al [26] and increased Inhibition size index of plant growth by results of Mahdavi et al [12] was confirmed. Symptoms of Pb toxicity in concentration of 1000 mg/l occurs with yellowing leaf and roots, reducing dry biomass, plant height and the vitality and viability. However, due to young seedlings, if continued treatment with high concentrations of Pb, could be a probably that all plants eliminated, because the survival of in fifteen pots was 85%.

- The potential uptake and transfer of Pb and Zn in *P. cineraria* seedlings

The root is the first organ contact with toxic elements, and as usual, the accumulation of metals in plant roots is more of aerial organs [13]. It In fact protection the aerial parts of the plant against toxicity of metals at high concentrations as well as more plants accumulate heavy metal, little ability to transfer pollution from root to aerial organs [24]. According to results this study, was found that the coefficient of underground and overhead limbs bioaccumulation of lead and zinc in all treatments more than one and less than one agent in all treatments. The research found that Bioconcentration coefficient of underground and aerial organs of Pb and Zn more than one and transfer agent less than one in all treatments. Based on research results, specie that the coefficient of root was greater than one and transfer agent smaller than one, Plant species suitable for stabilization [27]. On the other hand, amount accumulation of Zn in root, stem and leaf 3046/2, 532/1 259/73 mg/kg respectively that occurred at 500 mg/l. In fact, the Zn uptake in root was six times more than of stem and 12 times of leaf. Also the highest amount of Pb accumulation in root, stem and leaf 2518, 665, 392 mg/kg were respectively that happened in treatment 100 mg/l. In fact, absorption amount of Pb in the root was four times more than of stem and seven times of leaf (much absorption of Zn compared to absorption of Pb show that it was necessary) (Tables 5 & 9). According to the maximum absorption of Pb and Zn in roots compared to aerial organs, It can be concluded that *P. cineraria* has high potential, suitable for stabilization that with the results MacFarlane and Burchett [11], Mahdavi et al [12], Qiu et al [18] was confirmed. Based on the findings Reeves and Baker [19] plants have ability accumulate more than 0/1% of 1000 mg/km of Pb and 1% 1000 mg/kg Zn in their aerial organs, are considered ultra- accumulation species. According to the results showed that *P. cineraria* is ultra-accumulation of Pb. Because of in concentration of 1000 mg/l, *P. cineraria* 4-month-old seedlings showed ability to accumulate 1057 mg/kg of Pb in their aerial organs. Also results showed that by increasing the concentration of pollutants in the organs, enrichment coefficient increased that reflects the ability of Pb and Zn concentrations in aerial organs with increased concentrations of metals in soil, and in the all treatments difference was significant that with the results Assareh et al [1] was confirmed. Therefore absorption index is strongest criteria for determining the potential of refinement of plant. In both metals, with increasing concentration of pollutants, decreased absorption index, which reflects the impact of metals on the plant biomass. In the end, due to the high concentration of Zn and Pb in the roots, strong tolerance and root system of *P. cineraria* (value of *P. cineraria* is high resistance in saline soils and dry areas), have high fixation potential for clearing areas contaminated with these metals in dry areas. Since amount of transition of Pb and Zn to aerial organs was low, the risk of getting these metals into the food chain through animal domesticated by feeding leaf is little and plant root as a biological ores to the revival of this metals are used.

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