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ORIGINAL ARTICLE

Studying of Salinity Stress Effect on Germination, Proline, Sugar, Protein, Lipid and Chlorophyll Content in Purslane (*Portulaca oleracea* L.) Leaves

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Approximately 30% of country regions are under influence of salt and one of the main important methods for increasing of hectare performance in salt soils, using of resistant plant against with salt such as medicinal annual plant of Purslane (*Portulaca oleraceae* L.).Studying of the salt stress effect on germination and some physiological parameters in Purslane was carried out in completely random framework and with three replications and under controlled conditions. In this study, salinity was imposed by sodium chloride (NaCl) and in five levels of framework included of Control (distilled water), 50, 100, 150 and 200 Mmol from NaCl. Studied physiological parameters included of proline, sugar, protein, lipid and chlorophyll in Purslane leaves.In relation with observed germination that increasing of salt level, germination rate was reduced that the least germination rate in 200 Mmol and the highest germination was observed in control which in statistical level 0.01 showed meaningful difference. Also, results showed an increasing of leaf proline and sugar that was synchronize with increasing of sodium chloride, this increasing in statistical level of $P<0.01$ was meaningful, while blank had the least rate and salt level 200 Mmol was observed. Synchronize with increasing of salinity level, lipid and protein concentration decreasing that was meaningful ($P<0.01$) which highest of leaf lipid and protein content in control level and least concentration was observed in 200 Mmol of salinity level. Also, salinity stress due to increasing of chlorophyll a and b levels in Purslane leaves which this increasing in leaf chlorophyll b concentrations in 0.01 statistical level was meaningful and the least level chlorophyll a and b in blank and the highest level of chlorophyll a and b by order in 150 and 200 Mmol of NaCl was observed. The results showed that plant for resistance against salinity increasing of proline, sugar and chlorophyll content in leaves are useful for retaining and improving of photosynthesis quality in plants.

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One of the most important features of soil and water in agriculture is salinity which it due to presence of more ions (Etesami et al, 2007). Approximately 30% of Iran regions are more than 17 million hectares under influence of salt (Ghassemi et al, 1995), and using of resistant plant against with salinity one of the most effective methods in exploiting and increasing hectares performance in salt and low-salt soils of arid and semi-arid of the world (Khalesro and Agha alikhani, 2006). Some results mentioned that salinity decrease of sugars store and as a result it can distort the respiration metabolism of embryo growth (Kazerouni, 2005). Salinity with osmosis potential solution reduction can reduce plant growth. It's reason is that alien with water molecules existence in environment, there are ions that preventing of water absorption by plants root and plant face with a water deficit (Tobe et al, 1999). With respect to more than 60 millions hectare from the world regions (25%) of regions in all over the world) face with salinity problem, doing of project in along with decreasing of salt soil damage is necessary (Taffouo et al, 2010). Purslane (*Portulaca oleraceae* L.) is an annual plant and from Portulacaceae family which it's current name was Purslane are using for reclamation of salt soils. This plant included of much values of Omega-3 fatty acids,hence it is one of the most valuable medical plants in the world.It used as an antiseptic, antisposmodic, diuretic, antipyretic, muscle loose, antioxidant, reinforcing of safety system, blood filtering and for removing of thirsty has medical application (Schuman, 2001).It had a global distribution and taxonomy by eight current plants groups in the world (Liu et al, 2000).It was a main weed for 45 cultivating types in 81 countries of the worlds (Holm et al, 1977). Life cycle of this plant during of 2 to 4 months will complete (Chauhan and Johnson, 2007). Photosynthesis mechanism devoted to C_4 and had the ability of converting to photosynthesis mechanism CAM that this factor in great extent is reason of resistance and consistency of Purslane proportional to environmental stresses (Koch and Kennedy, 1981).With respect to Purslane as a valuable medical plant and consistence with environmental condition and few information in relation with this plant reaction to salinity, performing of this study necessary and important.

MATERIALS AND METHODS

For studying of salinity stress effect on germination and physiological factors of Purslane seeds were prepared in Iran Jungle and Pasture Research Institute,Iran. Related studies was carried out in 2010 at Islamic Azad University of Tonekabon under controlled condition. Seeds was put in 5% sodium hypochlorite solution of for 1 minute and then by distilled water washed for antiseptic of it (Falahati, 2006). Seeds was cultivated in petri dish, seedling transported in washed sand pot for controlling of their growth after 3 leaves stage. Hogland solution was added that get solution process performed every one week (table 1). After multi-leaves stage in seedlings, stress for one week was performed then physiological parameters was evaluated. Salinity stress in five levels and by imposing sodium chloride (NaCl); Blank(distilled water), 50, 100,150 and 200 Mmol from NaCl. After passing of stress period, proline was evaluated by Bates method (1973), sugar by Nelson method (1943),protein by Lowery method (1951), chlorophyll by Lichtenthaler method (1987) and for evaluating of lipid by sokseleh set was applied. Experiments in completely random framework and with three replications was performed. Data Analysis,variance and comparison of mean by Dunkan experiment and SPSS software was done and drawing of diagrams was used from Excel software.

Table 1. Contents of nutrient solution used for irrigation of Purslane seedlings

main solution (g/L)	Resource	Element name
59.025	$Ca(NO_3)_2.4H_2O$	Calcium nitrate
25.275	KNO_3	Potassium nitrate
61.6	$MgSO_4.7H_2O$	Magnesium sulfate
34.025	KH_2PO_4	Potassium di hydrogen phosphate
0/715	H_3BO_3	Boric acid
0/4525	$MnCl_2.4H_2O$	Manganese chloride
0.055	$ZnSO_4.5H_2O$	Zinc sulfate
0.02	$CuSO_4.5H_2O$	Copper sulfate
0.0225	$H_2MoO_4.H_2O$	Molybdic acid

RESULTS

Results showed that meaningful effect of salinity stress on germination, proline, sugar, leaf lipid, protein and chlorophyll contents in Purslane leaves($P<0.01$). In relation with germination percent observed which imposed salinity level occurred meaningful decreasing while the highest observed germination percent in blank and it's least in salinity level 200 Mmol was exist(Figure 1). The free proline level in Purslane leaves with salinity level increasing,had meaningful increasing which the highest rate of proline was observed in 200 Mmol of salinity level and the least proline concentration observed in blank (Figure2).Leaf sugar concentration with increasing of applied NaCl level, increased but didn't see any meaningful difference in leaf carbohydrates concentration in 150 Mmol level, but in 200 Mmol salinity level we can find meaningful was increased which meaningful difference was recorded with blank level (Figure3).Decreasing of leaf proteins concentrations synchronize with increasing of salinity stress was meaningful, while the highest rate of proteins concentration in blank and the least of proteins rate observed in 200 Mmol level of salinity stress (Figure4). In relation with leaf lipid content observed that with over heading of imposed salinity level,meaningful was decreased occurred in lipid concentrations, while the lowest rate of lipids in 200 Mmol of salinity level and the highest level of that observed in blank (Figure5).But out of expect salinity stress imposing on Purslane due to increasing of chlorophyll a,b in leaves. In relation with chlorophyll a, the highest concentration observed in 150 Mmol of salinity level and the lowest of that was observed in blank and the least chlorophyll b content was observed in blank and highest concentration of that in 200 Mmol of salinity stress were observed (Figure 6&7).

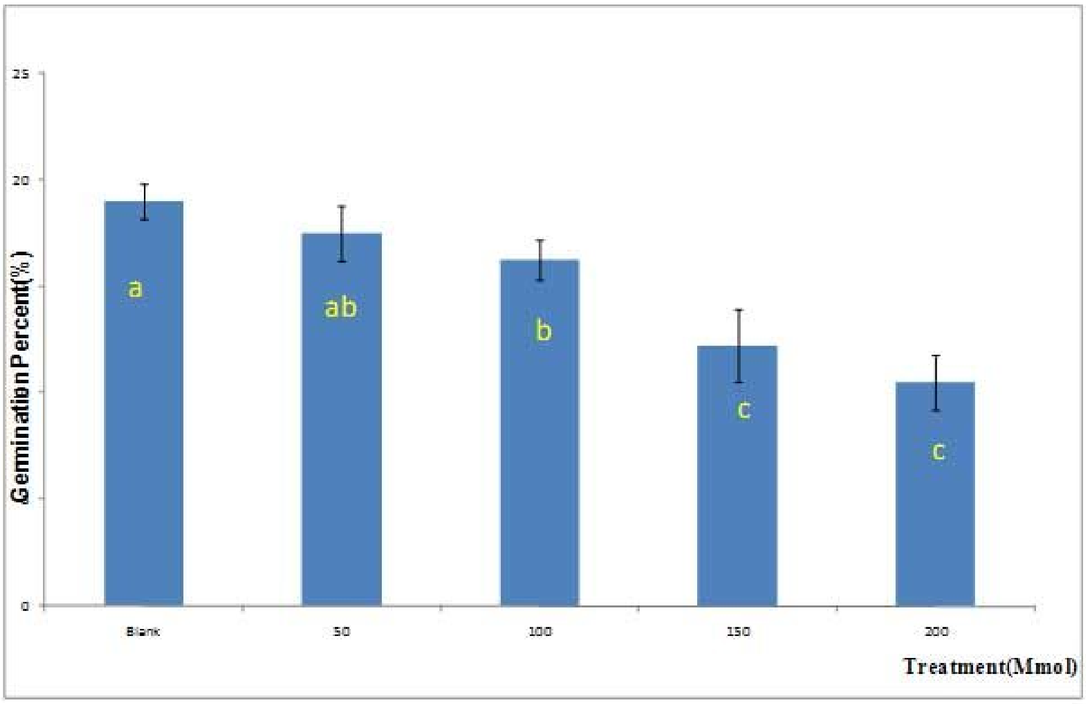

Fig.1.Effect of salinity stress on Germination

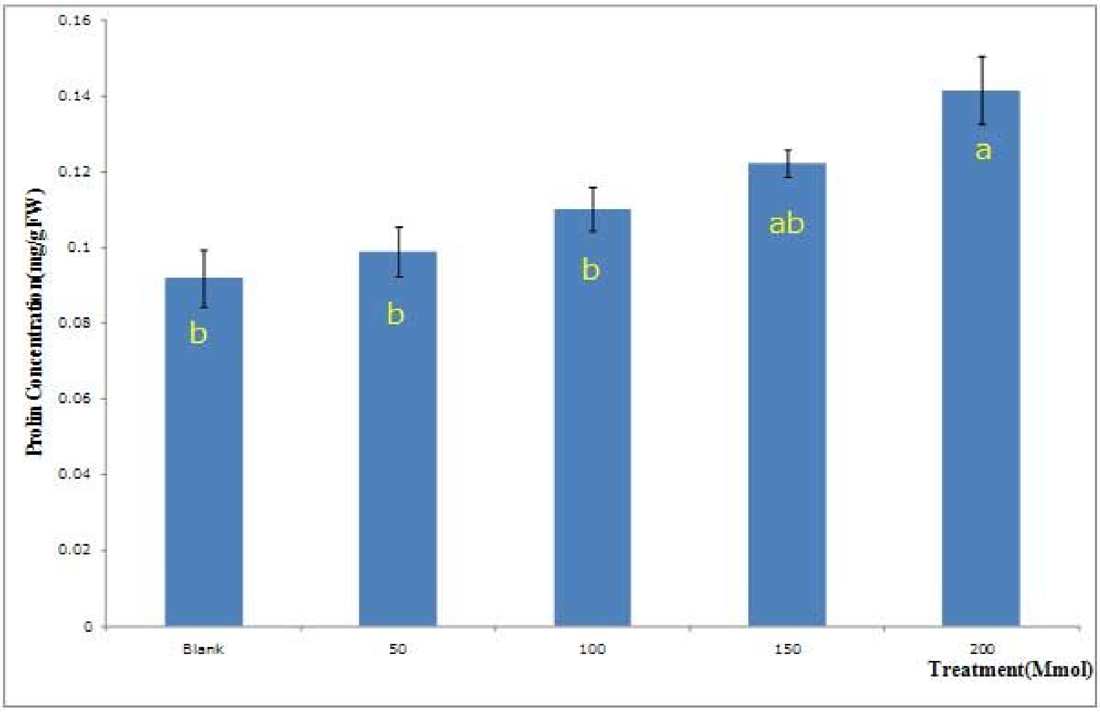

Fig.2.Effect of salinity stress on Proline content

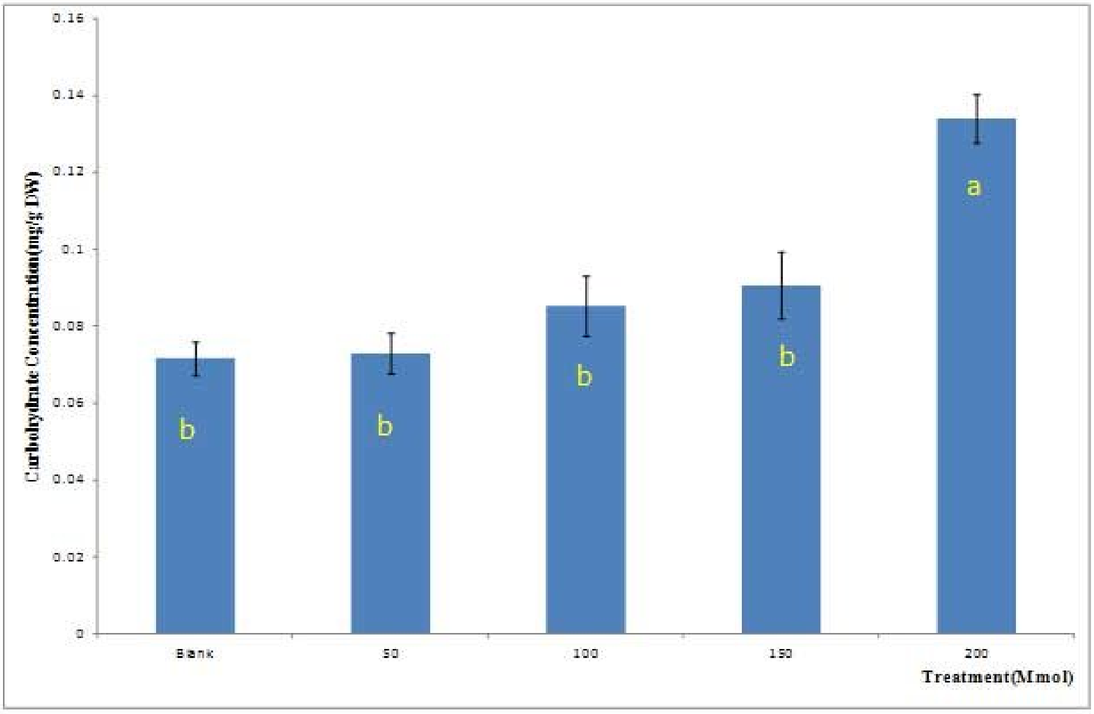

Fig.3.Effect of salinity stress on Carbohydrate content

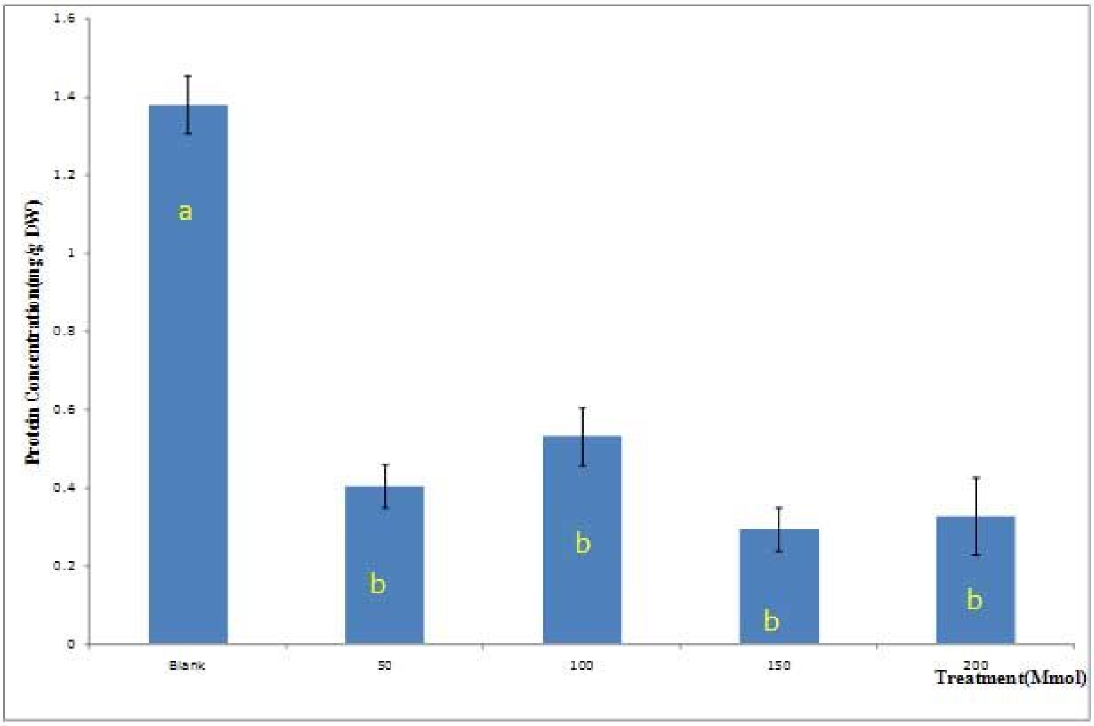

Fig.4.Effect of salinity stress on Protein content

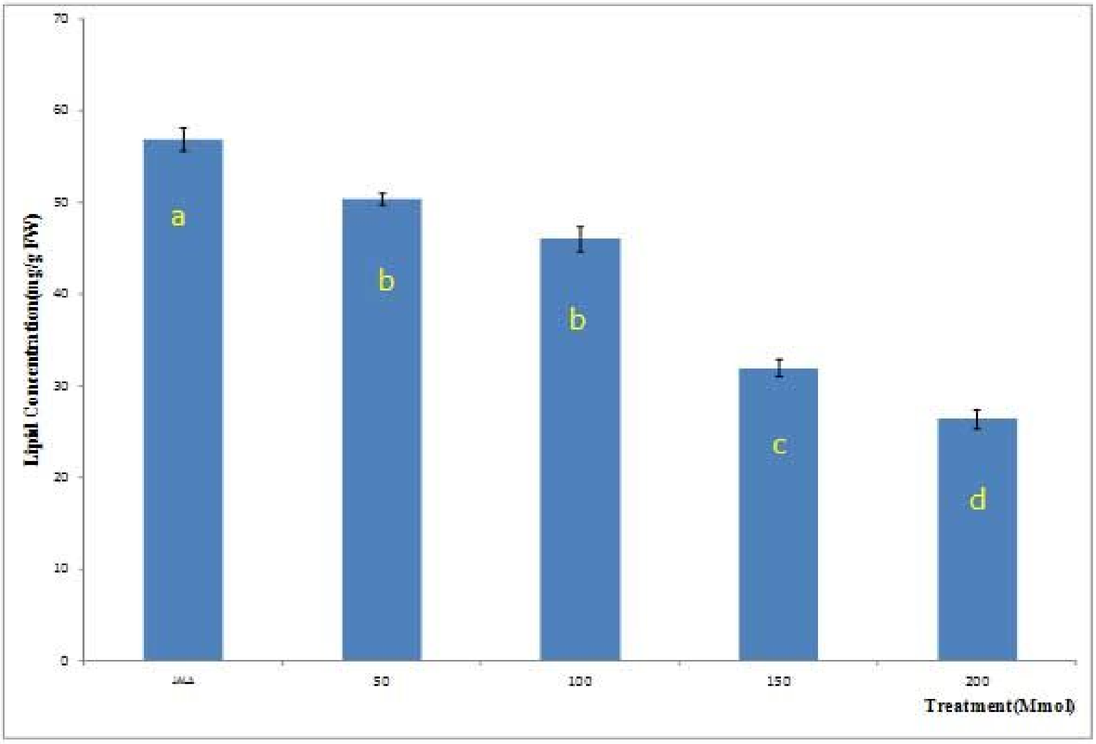

Fig.5.Effect of salinity stress on Lipid content

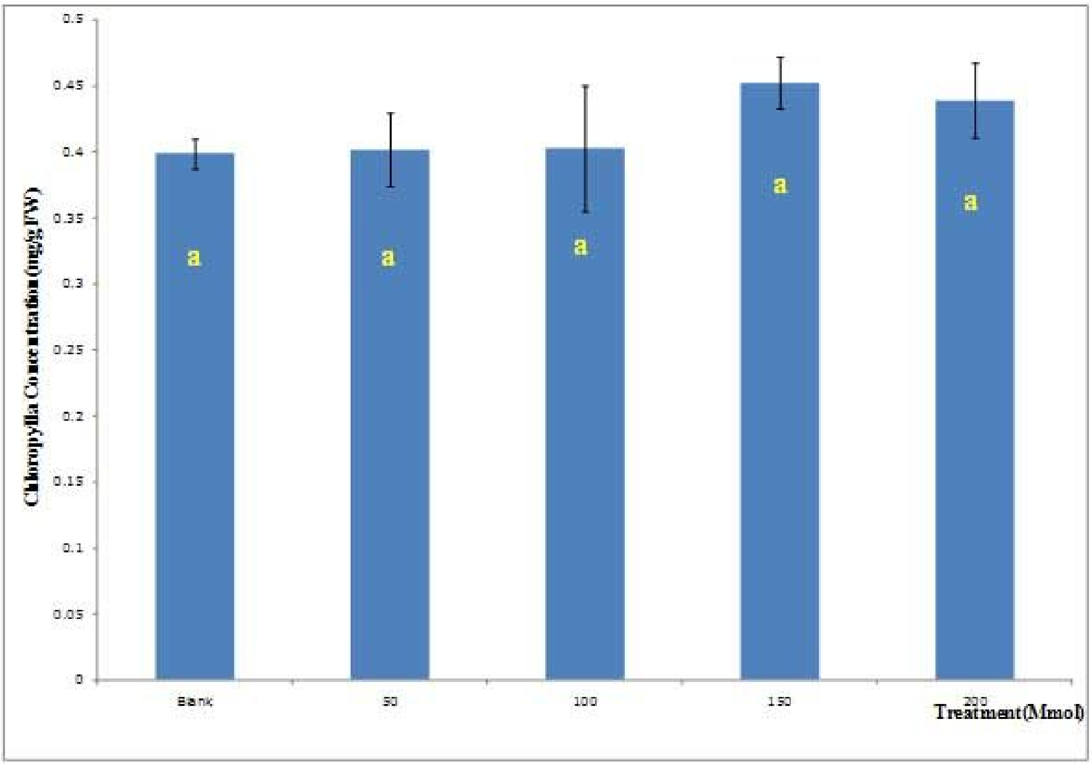

Fig.6.Effect of salinity stress on Chlorophyll a content

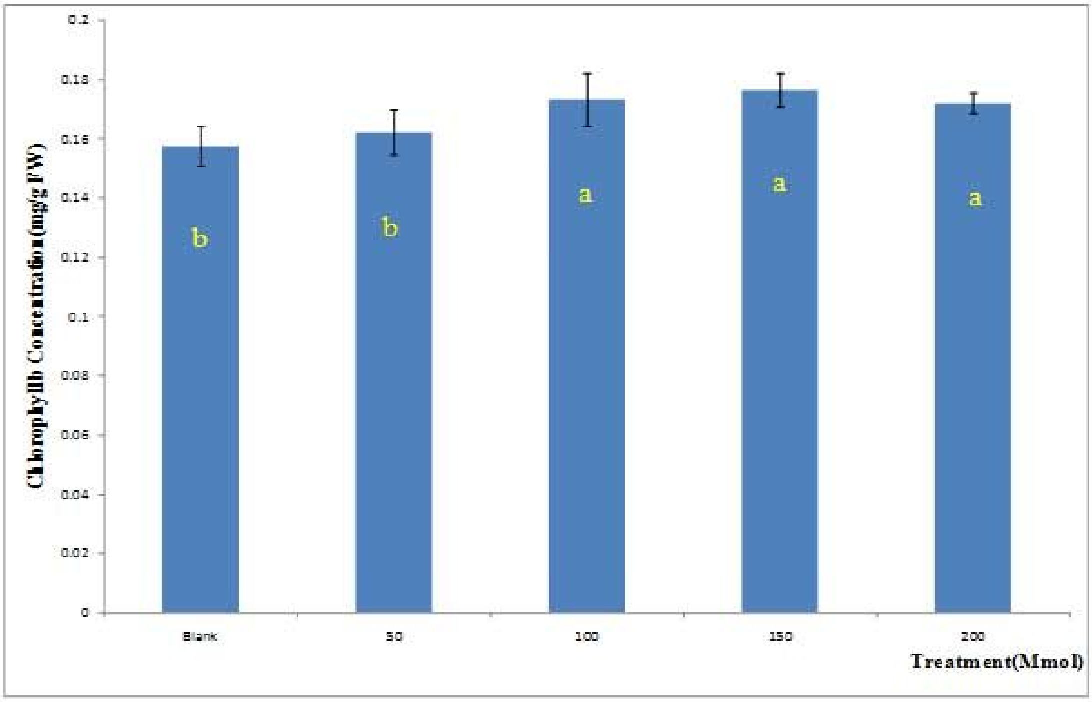

Fig.7.Effect of salinity stress on Chlorophyll b content

DISCUSSION

Different studies showed that different levels of salinity stress on germination in a variety of plants which can infer to meaningful decreasing on *Vigna radiate* L. and *Lens culinaris* (Kazerouni et al, 2005), *Elymus Junceus* (Askarian, 2004), forage sorghum and pearl millet (Khalesro et al, 2006). Mainly salinity stress by low osmosis potential and ionic poisonous can reduce germination and for this reason it can influence on germination percent more than drought (Alebrahim et al, 2008).Under salinity stress,plants have mechanisms against with that which accumulation of solution components such as proline one of the primary responses of plant proportion to salinity (Fedina et al, 2002; Yeo,1998). Yazici et al in 2007 was performed of Purslane, he was observed that with increasing of salinity imposed, free proline content in leaves was increased which confirm this result. In other research on barley (*Hordeum vulgare* L.)was observed that proline as a reducer component of osmosis pressure in response to increased of salinity (Ueda et al, 2007). Also, increasing of proline content in cotton (Desingh et al, 2007), *Paulownia imperialis* (Astorga et al, 2010) and wheat (Khan et al, 2009) was synchronised with increasing of salinity level is reported. Increasing of proline level under salinity stress was recognised due to that proline is consistent smolite, macromolecules conserver and remover of active oxygen producing in during of environmental stress(Desingh et al, 2007). Studies showed that proline accumulation in plants was performed by different methods(Yordanov et al, 2003):

1) Stimulating of synthesis from pre-material

2) Reducing of Proline Oxidas activity.

3) Proteins destruction

4) Reducing of proteins structure partnership.

In this research, proteins concentrations with increasing of salinity level showed reduction, of course in relation with salinity effect on protein synthesis, showed different results which depended on plant species. Terminal content decreasing of solution protein in plants such as *Helianthus annuus* and *Colcus blumei* (Yu et al, 1999), *Vicica faba* and *Amaranthus* (Doganlar et al, 2010), and also increasing of protein level in plants such as cotton (Jiang et al, 2005), *Pancratium maritimum* (Khedr et al, 2003) under salinity stress was reported. Vibration in protein solution terminal content, was resourced synthesis of stress proteins (Doganler et al, 2010). Different of physiological studies was offered which under salinity condition of non-structural carbohydrate such as Sucrose and Hexanes accumulated with the rate of this accumulation and concentration increasing in different plant species can be different. This increasing of solution carbohydrates concentration as a result of increasing of starch hydrolyze which it needs to hydrolytic enzymes activity (Bartels et al, 2005). Different studies in plants with salinity stress increasing, sucrose santase enzymes activity increasing and invertase enzymes activity was reduced. Sugar is the main molecule symptoms which influence on different physiological response in regulated genes in photosynthesis, metabolism and defensive Reponses (Crowe et al, 2002). Carbohydrate accumulation in plants tissue under condition of environmental stress due to regulating and osmosis adjustment in current stress (Dhanapackiam & Ilyas, 2010).Increasing of sugar content under condition of salinity stress in such plants as tomato(Amini & Ehsanpour, 2005) and barley (Bagheri & Sadeghipour, 2009) was reported. increasing of sugar under environmental stress was recognized as a result of starch degradation, sugar synthesis by non-photosynthesis pathways, non-converting of these components to other productions and decreasing of transporting from leaves (Premachandre et al, 1991). Lipids and proteins are major components in membrane which has main role in plant cell resistance in proportional to environmental stress. Environmental stress due to disordering in cohesions of membrane lipids and proteins (Yordanov et al, 2003). Under condition of stress main changes will happen in lipids metabolism (Kesri, 2002). Mono galactosyl di glyceride (MGDG) is main glycol lipid in leaf was effect of intensive stress imposing, was reduced that is express of chloroplast membrane destructions (Yordanov et al, 2003).In other hand, lipid peroxidation was synchronized with increased of the salinity level which had a relation with plants such as Wheat (Hala et al, 2005), Tomato (Neumann, 2001) and Purslane (Yazici et al, 2007) was reported. With changing of leaf chlorophyll content by salinity stress, terminal photosynthesis level, distillation speed and stomatal transport was under control meaningfully (Doganlar et al, 2010).Content reduction of chlorophyll in plants such as *Poulownia imperialis* (Astorga et al, 2010),Bean (Beinsan et al, 2003) and *Carthamus tinctorius* (Siddiqi et al, 2009) was reported. The cause of this reduction was the increasing of destructive enzymes called chlorophyllase. Photosynthesis pigments content under condition of salinity will not reduced and some reports due to increasing of leaf chlorophyll level under stress. Increasing of leaf chlorophyll content under salinity stress was reported by Pinheiro et al in 2008 on *Ricinus Communis* and also by Jamil et al in 2007 on *Beta vulgaris* L. Mainly the reason increasing of leaf chlorophyll content under salinity stress as a result of the increasing of chloroplast in leaves under stress which occurred for maintaining of plant photosynthesis that from symptoms of plant resistance in proportion to environmental stress. non-decreasing of chlorophyll content in stress condition expressing of plant resistance against with light damages of chloroplast, while a positive relationship was reported between anti-oxidant enzymes and conserving rate of chlorophyll(Yang et al, 2006). As a result, obtained conclusions symbolic of high resistance of medical plant Purslane are proportional to environmental stresses that can be as a medical plant in low-rain regions and with water limitation and salt regions was respected.

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