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Chemical Constituents and Seedlings Growth of *Dalbergia Sissoo* Roxb. as Affected by Magnetic Diluted Seawater and Bio fertilization Treatments

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Abstract

This trial was conducted to investigate the effect of magnetized diluted seawater and bio fertilization on seedlings growth and chemical constituent of *Dalbergia sissoo* . during the two successive seasons of 2016 /2017 and 2017/2018 at the experimental farm of El-qanater El Khairia Horticultural Research Station, Egypt. Three diluted seawater at concentrations of (2000, 4000 and 5000 $mg1^{-1}$) as well as control (Nile Water) have taken and four treatments were used namely magnetized diluted seawater alone, biofertilizer with mixtures of Cyanobacteria (algae of *Anabaena sp*. and *Nostoc sp*.), biofertilizer plus magnetized technique and the control which non- magnetic and non- biofertilizer. The obtained results demonstrated that different salinity levels significantly reduced increment of seedling height, stem diameter, leaf area, root length and fresh and dry biomass, whereas the high levels of 5000 $mg1^{-1}$salinity neither the seedlings irrigated with separately saline water nor were treated with magnetization or bio fertilization survived, also salinity caused a reduction in total chlorophylls and total carbohydrates in contrast proline content increased, mineral nutrition's N, P and K % decreased whereas Na increased consequently K^+/ Na^+ ratio decreased. Treatment of exposure the seedlings to magnetized diluted seawater or non-saline significantly increased all parameters of plant height, stem diameter, leaf area, root length and fresh and dry weight biomass compared to control, also bio fertilization as alone or as a mixture with magnetic device resulted in an increase in total chlorophylls , total carbohydrates in the stem, proline content in leaves and the absorption elements of N, P and K % raised while, Na+ content decreased consequently K^+/ Na^+ ratio increased. Therefore, the current study cleared that seedlings of *Dalbergia sissoo* tolerated salinity level up to 4000 $mg1^{-1}$ and the magnetization or bio fertilization ameliorated most of the growth parameters and enhanced the status of chemical constituents producing healthy seedlings.

Keywords: Magnetic diluted seawater, biofertilizer, algae, cyanobacteria, timber trees.

1. INTRODUCTION

Dalbergia sissoo **Roxb., (Shisham)** is a fairly large deciduous tree. Belonging to a family of Fabaceae. It is an important multipurpose tree. The wood is valued for furniture and other utility and fancy items. It is extensively planted along the riverbanks, canal side and roadside. It is amongst the principal tree species commonly recommended for a forestation programmer in dry regions for soil and water conservation. *Dalbergia sissoo* is found in tropical to subtropical climates in natural and planted forests, mainly along forest margins near streams and rivers, hammocks, canopy gaps, agricultural areas, disturbed sites and roadsides **(Langeland & Stocker, 2001)**. This tree also has the potential of nitrogen-fixing which's why it is considered a very important tree **(Lal & Singh, 2012).**

Soil and water salinity is widespread across the arid and semi-arid regions of South Asia, Central Asia, and North Africa and affected agricultural productivity and livelihood of the rural population. Recent estimates suggest that up to 50% of mitigated land has become saline in these regions **(Sakadevan and Nguyen, 2010).** Plants growing in saline media come across generally with major drawbacks; the first is the increase in the osmotic stress due to high salt concentration of soil solution that decreases water potential of soil; the second is the increase in the concentration of Na and Cl, exhibiting tissue accumulation of Na and Cl and inhibition of mineral nutrients uptake **(Mesut *et al*., 2010).** The Salinity of soils and irrigation water is one of the limiting factors

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in plant productivity and agricultural yield and the results obtained showed several revelations in terms of morphological imbalance (leaf area, root length, physiological variation, decrease or increase of assimilation pigments, etc), and biochemical bioaccumulation such as proline and soluble sugars (Nadia and Louhichi ,2020).

Magnetization of water may affect phyto-hormone production leading to improved cell activity and plant growth (Maheshwari, 2009). Magnetized water increases the leaching of excess soluble salts, lower soil alkalinity, and dissolved slightly soluble salts such as carbonates, phosphates and sulfates **(Hilal *et al.* 2002).**

Recently, magnetizing saline irrigation water through a proper magnetic field has been introduced as an effective method for soil desalination **Selim (2008).** And **Khazan and Abdullatif (2009)** reported that the hydrogen bond in liquid water is highly affected by electrical and magnetic fields. It is found that some physical and chemical properties changed when water passes through a magnetic field. Therefore "magnetized water treatment" (MWT) has different chemical and physical properties and action than potable water which increase minerals solubility. **Zlotopolski (2017)** showed that MWT reduced-sodium concentrations in soil by leaching it below root zones. This could explain why plants treated by MWT had less leaf sodium levels compared to non-MWT. It has also been shown that MWT alters the distribution of salts among soil layers, reducing their concentrations in the upper layers, which are more important for agriculture; some data indicated that MWT offers many other benefits in agriculture such as increased yield, early maturity and increased fertilizer uptake. **Al Khazan *et al*. (2011)** cleared that the dissolving properties of water increase when started with a magnetic field as the magnetic water has small molecules, less viscosity, faster water movement and permeability at soil pores.

Treatment of water in a magnetic field can increase the yield of crops; improve the use of mineral fertilizers. Currently, magnetically activated water is used for soaking seeds, watering plants, soil salinization. **Savchenko *et al*. (2019).**

Cyanobacteria are a continually renewable biomass source that can release soluble organic substances to the environment. These substances such as vitamins, enzymes, carbohydrates, peptides, amino acids and growth promoters **Zulpa *et al*. (2003).** For agriculture and horticulture, microalgae have been shown to stimulate the growth of plants, due to the presence of auxins, cytokinins, gibberellins and related growth regulator substances **Aly *et al.*, (2008**). **Deepali *et al.*, (2020)** found that Cyanobacterial biomass can also be used for the large scale production of food, energy, biofertilizers, and secondary metabolites. Therefore, cyanobacteria are used in ecofriendly sustainable agricultural practice for the production of biomass of very high value and decreasing the level of CO_2..

cyanobacteria are photosynthetic prokaryotes, responsible for a large proportion of global CO_2 and N_2 fixation, with numerous environmental, and agricultural applications and able to increase the supply of nutrients, not only nitrogen but also others such as phosphorus, and increase the availability of water in the soil, improving its physicochemical conditions and promoting plant growth because of the release of different hormones. Faced with different abiotic stresses, the ability of various species of cyanobacteria to increase plant tolerance has been described because of their direct action in soils or the activation of plant responses. They reduce the effect of salinity by producing extracellular polysaccharide or compatible solutions **Poveda (2021).**

The present study aimed to evaluate the effects of different magnetic seawater dilutions treatments and the application of algae as biofertilizer on the growth and chemical composition of *Dalbergia sissoo* seedlings.

2. Materials and Methods

Experimental site: The present study was conducted during the two successive seasons of 2016/2017 and 2017/2018 at the experimental Farm of Forestry and Timber Tree Department, El-qanater El Khairia Horticultural Research Station, Qalioubia Government.20- km northwest of Cairo.

Plant materials: unified One-year-old of *Dalbergia sissoo* Roxb. seedlings were used in this study, in an average height of (32 cm) and stem diameter of (0.3 cm).

The physical and chemical analyses of the grown media were performed as described by **Piper (1950) and Klute (1986)** as shown in Table (1).

Table (1): The chemical and physical analysis of the soil that used in the study.

Chemical analysis of the soil before treatments									
Cations (Meq/L)				Anions (Meq/L)					
K^+	Na^+	Mg^{++}	Ca^{++}	SO_4^-	Cl^-	HCO_3^-	CO_3^-	Sp	EC ds/m
0.30	10.78	6.96	11.96	15.75	13.15	1.10	-	20.00	3.00

Physical analysis of the soil							
Soil type	Clay %	Silt %	Fine Sand %	Coarse sand %	$CaCO_3$	OM	pH
Sandy loam	4.30	10.20	45.40	40.10	1.00	0.70	7.51

The seedlings planted on March 1st both 2016 and 2017. planted individually in black plastic pots (25cm. diameter x30cm depth) filled with 6 kg sandy loam soil brought from a newly reclaimed area near Alexandria. Thick polyethene sheets were spread out under the experimental pots in the open field.

The potted seedlings were irrigated with Nile water for one month, then on April 1st, 2016 and 2017 in both seasons, the irrigation treatments were applied all over this period, where three diluted seawater concentrations of 2000, 4000, and 5000 $mg1^{-1}$, as well as the control (Nile water) treatment in the first season, were applied. Whereas using the highest concentration level of 5000 $mg1^{-1}$ caused plant mortality at the first season, therefore it was substituted with a lower concentration of 4000 $mg1^{-1}$ for the experiment in the second season. Both diluted seawater treatments and Nile water as control exposed to the magnetized or non-magnetized field before applying the irrigation. A magnetic tube (magnetron) unit of 3.5cm diameter was used for applying the magnetic field, where water passed through a tube of 250 mT magnetron device, produced by Magnetic Technologies Ltd, (Germany).

The saline water used in the study was prepared by adding measured amounts of seawater (35000 $mg1^{-1}$) transported from the Mediterranean Sea, in Alexandria to Nile water to achieve required salinity levels to obtain the concentrations (2000, 4000 and 5000 $mg1^{-1}$) using an electrical conductivity meter.

Biofertilizer by the mixture of cyanobacteria (*Anabaena* oryza and *Nostoc* muscorum) as nitrogen -fixing ability were added by the filtrate of algal cultures at the rate of 1.2 ml/pot **(Reddy *et al.*, 1986).** were added to the soil throughout (0, 2, 4 and 6 weeks) after planting. Cyanobacteria strains were obtained from the Microbiology Department, Soils, Water and Environment Res. Inst., Agric. Res., Center.

The main irrigation scheduling strategy used in the study was to apply enough water to bring the soil back to field capacity at the end of each irrigation.

The seedlings were irrigated to field capacity (approximately, twice-weekly in winter and three times weekly in the summer season) and the volume of irrigation water applied was determinate by knowing the changes in pot weight due to evapotranspiration since the last irrigation.

Every three times of irrigation by saline water one time of freshwater was used to leach the soil and avoided accumulate of salinity. The seedlings fertilized by 0.5 g. of Kristalon 19: 19: 19 as a resource NPK**.** The following parameters were recorded after 12 months from treatments in the 2016 and 2017 seasons.

A. Determination of vegetative growth:

1. Increment seedlings height (cm) was determined by measuring seedling height at the terminal of experiment minus seedling height at the starting the application of the treatment. **2. Stem diameter (cm)** was determined at the ground surface by vainer Caliper. **3. Leaf area (cm^2)** was recorded at the end of both seasons where samples of leaves from the medium part of the stem have taken and measured photometrically using a digital leaf area meter (LI –3000 Portable Area Meter), (L I- COR, LINCOLN, NEBRASKA, USA)**.4. Root length (cm)** plants of each treatment were accurately up rooted from the pot and roots were washed carefully to preserve the hairs root. Length of main root was determined from soil surface to the farthest point of root.

5. **Fresh and dry biomass (g).** Fresh weight of roots, stems and leaves were estimated by weighing each portion individually, then the fresh weight of whole plant (fresh biomass) accounted. The fresh portions of seedlings were subjected to oven-dry at 70 c° until constant weight, then the dry weight of each portion, (roots, stems and leaves) were recorded and the dry weight of the whole plant (dry biomass) was estimated for each treatment in both seasons.

B. Chemical analysis:

1. Total chlorophylls (mg/g f.w) were extracted from fresh leaves taken from the middle part of the stem of experimental plants using the DMSO method based on **Barnes *et al.* (1992).** Chl *a* and Chl *b* concentrations were calculated based on the absorbance of the extract at 663.8 and 646.8 nm.

2. Total carbohydrates concentration in stems: were estimated by the absorbance at 490 nm as described by **Dubois *et al.* (1956)**. Using glucose as a standard was expressed as a percentage.

3. Proline concentration was determined spectrophotometrically by adopting the ninhydrin method of **Bates *et al.* (1973).** we first homogenized 300 mg fresh leaf samples in sulphosalicylic acid. To the extract, 2 mL each of acid ninhydrin and glacial acetic acid were added. The samples were heated at 100°C. The mixture was extracted with toluene and the free toluene was quantified spectrophotometrically at 528 nm using L-proline as a standard. The proline concentration was determined from standard curve and calculates on mg/100 g fresh weight.

4. Determination of some elements:

Every season, the samples of fresh leaves were washed with tap water and distilled water. These samples were dried in oven dry at 70 °C until constant weight, the finely ground samples of (0.2 mg-each) were used to determine elements as a percentage.

4.1. Nitrogen content of dried samples of leaves was determined by modified Microkjoldahl method as described by **Pregl (1945)**.

4.2. Phosphorus percentage in leaves was measured with a spectrophotometer at 880 nm according to the method described by **Rowell (1993)**.

4.3. Potassium was determined using the flame spectrophotometry method **Black (1982).**

4.4 Sodium concentration as a percentage was determined using a flame photometer according to the method described by **Irri (1976)**.

4.5. Ratio of potassium and sodium content in leaves was determined by the account of each of K^+/ Na^+.

The experimental design

The pots were distributed in split-plot design treatments, where the main plot was the salinity levels of diluted seawater at 2000 and 4000 $mg1^{-1}$ concentration, as well as the control (Nile water), while the subplots; namely: magnetic system alone, magnetic plus biofertilizer, biofertilizer single and the control (non-magnetic and non-biofertilizer). Three replicates were assigned for each treatment, and each block included all the treatments of salinity, magnetized system and bio fertilization, where each saline concentration was represented by 48 seedlings while each magnetized system treatment includes 12 seedlings and bio fertilization include 12 seedlings during the first and second season. The statistical analysis was conducted according to **Snedecor and Cochran (1980).** The Least **s**ignificant differences were used to compare means at 5% probability**.** According to Dunce's Multiple, Range Test.

3. Results and Discussions

A. Vegetative growth:

Effect of magnetized seawater dilution and bio-fertilizer treatments on the increment of seedling height, stem diameter and leaf area of *Dalbergia sissoo* seedling during seasons of 2016 / 2017 and 2017 / 2018.

1. Increment of seedling height:

Data presented in Table (2) cleared that increment of seedling height significantly reduced owing to saline water irrigation at both levels of 2000 and 4000 $mg1^{-1}$ where the reduction in height growth of *Dalbergia sissoo* reached 11.12 and 19.78 % than control, respectively. Concerning the impact of magnetized seawater dilutions treatments and bio fertilization the results shown in Table (2) that both magnetization and bio fertilization treatments increased for seedling height compared to control and the differences were significant in which the exposure the plants to magnetic field individually, bio fertilization alone and magnetic field alongside biofertilizer, increased height by 38.1, 43.04 and 47.44 % over control in the first season and 16.49, 22.44 and 35.94 %, respectively in the second one, respectively.

The interaction among salinity levels and treatments of both magnetization and bio fertilization cleared that the highest seedling height recorded in the seedlings irrigated with Nile water and exposed to magnetic field plus bio fertilizer since the mean values were 51.45 and 41.89 cm in both seasons. Whereas the lowest was 29.00 and 21.67 cm in the seedlings irrigated with saline water at a level of 4000 $mg1^{-1}$ and did not expose to a magnetic field or non-biofertilizer moreover, the plants irrigated with 2000 mg1-1 saline water and treated with magnetic field alone, biofertilizer only and mixture declared excessive height growth by 20.13, 20.13 and 31.94 % over control, it is evident that exposure the plants to magnetized seawater treatment or biofertilizer prevented the harmful injurious effect as a result to salinity stress.

It could be also concluded that salinity levels of 5000 $mg1^{-1}$ either separately in irrigation water or treated with magnetic or biofertilizer caused the death of all the plants meaning that *Dalbergia sissoo* seedlings tolerated salinity up to 4000 $mg1^{-1}$.

These results were in the agreement with those obtained by **Mazhar *et al.* (2011)**, **Silva *et al.* (2012)** on *Jatropha curcas*, **Soliman *et al***. **(2015)** on *Moringa peregrine* and **Sherbeen (2018)** and **Sarhan *et al.* (2020)** on *Sweitenia macrophylla,* they demonstrated that plant height decreased significantly with the increase of salinity levels. Such a decrease in plant height might be due to that, the inhibition of both meristematic activity and cell elongation by using salinity the obtained results- producing from biofertilizer effect was in harmony with the finding of **Grzesik *et al.* (2017)** on willow (*Salix viminalis* L.) who found that bio fertilization with cyanobacteria and green algae improved the growing seedlings. It resulted in the increased height, and their total length compared with the control, probably due to the transfer of a higher quantity of active compounds from microalgae strains and their increased accumulation in willow plants.

2. Stem diameter (cm):

The data presented in Table (2) cleared that the plants irrigated by different diluted of seawater at levels of 2000 and 4000 $mg1^{-1}$ diminished significantly stem diameter by 6.5 and 16.3 % in first season and 8.3 and 15 % in the second one than control, regardless the effect of magnetized system and bio fertilization. On the other hand, the plants exposed to the magnetized device or biofertilizer alone increased stem diameter by 0.58 and 0.57 cm than control, and the stem was the thickest diameter 0.59 cm with the treatment of magnetic plus biofertilizer.

The interaction apparently that the thickest stem diameter was 0.64 cm in the plants treated with a mixture of biofertilizer and magnetically system and irrigated with Nile water but the minimum was 0.48 cm in the plants treated with saline water at the level of 4000 $mg1^{-1}$ and non-magnetized or non-biofertilizer. The previous results of the effect of salinity were following **Alssefat (2006)** on *Khaya senegalensis* and **Sherbeen (2018)** on *Sweitenia macrophylla* confirmed that salinity declined stem diameter.

Table (2): Effect of magnetic seawater dilution and biofertilizer on the increment of seedling height, stem diameter and leaf area of *Dalbergia sissoo* seedling during 2016/2017 and 2017/2018 seasons.

Salinity	Increment of seedling height (cm)							
	First season; 2016/2017				Second season; 2017/2018			
Treatments	**Nile water**	**2000**	**4000**	**Mean**	**Nile water**	**2000**	**4000**	**Mean**
Control	34.78f	31.33g	29.00h	**31.70D**	33.00c	27.56d	21.67f	**27.41D**
Magnetization	45.78c	41.78d	35.78ef	**43.78C**	37.22b	32.78c	25.78e	**31.93C**
Biofertilizer	48.89b	41.78d	37.45e	**45.34B**	38.00b	33.78c	28.89d	**33.56B**
Magnetization + Biofertilizer	51.45a	45.89c	42.89d	**46.74A**	41.89a	37.89b	32.00c	**37.26A**
Mean	**45.23A**	**40.20B**	**36.28C**		**37.53A**	**33.00B**	**27.08C**	
	Stem diameter (cm)							
Control	0.59b	0.52d	0.48e	**0.53C**	0.58bc	0.52e	0.47f	**0.52C**
Magnetization	0.60b	0.59bc	0.54d	**0.58B**	0.61a	0.57c	0.53de	**0.57B**
Biofertilizer	0.61b	0.57c	0.52d	**0.57B**	0.59b	0.54d	0.52e	**0.55B**
Magnetization + Biofertilizer	0.64a	0.59bc	0.52d	**0.59A**	0.62a	0.58bc	0.52e	**0.58A**
Mean	**0.61A**	**0.57B**	**0.51C**		**0.60A**	**0.55B**	**0.51C**	
	Leaf area (cm2)							
Control	169.3f	140.0h	86.37k	**131.9D**	157.9d	96.19h	86.40j	**113.5D**
Magnetization	185.5c	178.9d	95.50j	**153.3C**	169.9c	111.6g	88.14j	**123.2C**
Biofertilizer	192.1b	174.2e	121.0i	**162.4B**	175.3b	123.8f	91.89i	**130.3B**
Magnetization + Biofertilizer	213.4a	193.6b	143.3g	**183.4A**	190.1a	138.7e	112.6g	**147.1A**
Mean	**190.1A**	**171.7B**	**111.5C**		**173.3A**	**117.6B**	**94.76C**	

* Mean values in the same column of different treatment followed by the same capital liters are non -significant at 5% probability.** Mean values in the same row of different salinity levels followed by the same capital liters are non-significant at 5% probability.*** Mean values in each column and row followed by small liters are non-significant at 5% probability.

3. Leaf area (cm).

Data existed in Table (2) indicated that leaf area of *Dalbergia sissoo* seedling irrigated by diluted seawater at levels of 2000 and 4000 $mg1^{-1}$ significantly reduced compared with the control where the percentages of reduction were 9.68 and 41.35 % in the first season and they were 32.14 and 45.32 % in the second one, respectively, regardless the effect of magnetization and biofertilizer treatments.

Increasing salinity levels led to decrease leaf area as supported by **Mazhar *et al.* (2011)** on *Jatropha curcas* and **Sherbeen (2018) and Sarhan *et al.* (2020)** on *Sweitenia macrophylla* they reported that leaf area declined with increasing salinity concentration and when the plants exposed to magnetic device resulted in significant increases in leaf area equilibrium 16.22 and 8.63% than those of non-magnetized application in the first and second seasons, respectively. While the seedlings exposed to a mixture of magnetization besides biofertilizer treatment or bio fertilization single the leaf area increased, 39.04 and 23.12 % and 29.6, 14.8 % in both seasons, respectively over control.

The interaction among salinity concentrations and treatments of both magnetically and biofertilizer differed significantly since the lowest leaf area 86.37 cm correlated with saline water at the level of 4000 $mg1^{-1}$ combined with non-magnetically while the largest leaf area was 213.4 cm in the plants treated with magnetized Nile water plus biofertilizer.

Furthermore, magnetic seawater alone, biofertilizer single and a mixture of biofertilizer along with magnetic treatments combined with saline water at the level of 2000 $mg1^{-1}$ induced largest leaf area rather than the plants irrigated with Nile Water combined with non-magnetic or biofertilizer since the increased were 5.67, 2.90 and 14.35 %, respectively over control.

The previous herein obtained results illustrated that magnetization enhanced the leaf area of *Dalbergia sissoo* in harmony with those obtained by **Khattab *et al.* (2000)** on Gladulus hybrids they reported that under the different levels of salinity the addition of magnetic treatment or bio fertilization led to producing a large area of Maiji leaves**.**

Concerning the effect of biofertilizer on vegetative growth, the obtained results coincided with the finding of many scientists such as **El-Gaml (2006)** explained that bio fertilization using cyanobacteria led to increased microbial diversity community in the soil through increased organic matter, microbial activity and nitrogenase activities and subsequently improved soil fertility and enhanced the growth parameters. **Shanan and Higazy (2009)** revealed that bio fertilization by cyanobacteria increased significantly leaf area.

4. Root length (cm).

As shown in Table (3) the results indicated that irrigation of the seedlings of *Dalbergia sissoo* with different seawater dilution at saline levels of 2000 and 4000 $mg1^{-1}$ significantly decreased root length especially the higher level of 4000 $mg1^{-1}$ in which the reduction was 26.71 and 19.98 % than control in both seasons, respectively, regardless the effect of magnetization or bio fertilization. These results are in the same line with those obtained by **Soliman *et al.* (2015)** on *Moringa peregrine* and **Sherbeen (2018)** and **Sarhan *et al.* (2020)** on *Sweitenia macrophylla* all of them reported that root length decreased as salinity levels increased.

As regarding the effect of magnetized and bio fertilization treatments, it can be cleared that root length significantly exceeded by 20, 1 and 31.19 and 42.19% over control, due to magnetization alone, bio fertilization separately and a mixture of magnetic plus biofertilizer respectively.

The interaction obvious cleared that the maximized root length was 63.56 cm in the plants treated with a mixture of biofertilizer and magnetically system combined with irrigated by Nile water, while the lowest was 35.89 cm exhibited in the seedling irrigated with saline water at a level of 4000 mgl^{-1} combined with non-magnetic or biofertilizer treatment. Furthermore, magnetic seawater separately, biofertilizer alone and biofertilizer plus magnetized treatment combined with the saline water irrigation at a level of 2000 mgl^{-1} gave root length longer than the plants irrigated with Nile water and non-magnetic or non-biofertilizer since the percent of increases were 14.10, 10.90 and 34.40 % over control.

The obtained results of magnetically treated water were supported by the finding of **De Souza (2005)** who cleared that magnetic treatments led to a remarkable increase in plant root length and **Anand *et al.* (2015)** showed that the use of a combination of all these Cyanobacteria isolates in consortium with Maize crop showed a significant increase in root lengths. Also, **Sarhan *et al.* (2020)** on *Swietenia macrophylla* reported that at any level of salinity the treatment of magnetization with or without biofertilizer enhanced the root length comparable with control and improved plant tolerance to salt stress**.**

5. **Fresh and dry Biomass (g).**

As shown in Table (4) irrigating the seedlings with saline water at levels of 2000 and 4000 mgl^{-1} significantly decreased both fresh and dry biomass compared to control in which the reduction equal to 15.27 and 27.77 % in fresh biomass, whereas reduction in dry biomass, was 16.43 and 31.58 % less than control. Regarding the influence of magnetic or biofertilizer application, it can be concluded that both of them significantly increased fresh and dry weight biomass either separately or as a mixture together compared to control. However, the mixture of magnetization plus bio fertilization recorded the highest increment in which fresh biomass were 41.32 and 31.37 g and dry biomass were 14.65 and 11.60 g in two seasons respectively and the interaction among salinity levels and treatments of magnetization or bio fertilization exhibited that maximized fresh and dry biomass ascribed to magnetized Nile water along biofertilizer and the lowest appeared in the seedlings irrigated with saline water at a level of 4000 mgl^{-1} and non-magnetic. Moreover, the seedlings irrigated with saline water at a level of 2000 mgl^{-1} and biofertilizer plus magnetized resulted in an increase in biomass fresh weight by 11.52 % over control, whilst biomass dry weight increased by 22.13 % over control at the same condition.

The above-mentioned results are in harmony with those mentioned by **Hishida *et al.*, (2014)** on *Jatropha curcas* and **Sherbeen (2018)** on *Sweitenia macrophylla* all of them reported that salinity levels especially the highest reduced biomass fresh and dry weights.

The herein obtained results illustrated that magnetization enhanced the biomass fresh weights of *Dalbergia sissoo* in coincided by **Yanju *et al*.,(2017)** showed that Magnetic-treated water irrigation significantly increased cotton seedling dry weight.

As regards, the effect of bio fertilization the obtained results from the herein study were in accordance by **Mohsen *et al.*, (2016)** on Lettuce Plants (*Lactuca sativa* L.) and **Grzesik *et al.*, (2017)** on (*Salix viminalis* L.) all of them found that bio fertilization with cyanobacteria and green algae improved the growth and biomass dry weight. **Sarhan *et al.* (2020)** on *Swietenia macrophylla* found that at any level of salinity the treatment of magnetization with or without biofertilizer enhanced the fresh and dry weights comparable with control.

Table (3): Effect of magnetic seawater dilution and biofertilizer on Root length of *Dalbergia sissoo* seedling during 2016/2017 and 2017/2018 seasons.

	Root length (cm)							
Salinity	**Nile water**	**2000**	**4000**	**Mean**	**Nile water**	**2000**	**4000**	**Mean**
Treatments	**First season; 2016/2017**				**Second season; 2017/2018**			
Control	44.89e	41.44f	35.89g	**40.74C**	43.89d	39.78e	36.56f	**40.08C**
Magnetization	59.56b	51.22d	36.00g	**48.93B**	50.89b	47.44c	39.89e	**46.07B**
Biofertilizer	57.11c	49.78d	43.22ef	**53.45B**	49.67bc	45.00d	39.89e	**44.85B**
Magnetization + Biofertilizer	63.56a	60.33b	49.89d	**57.93A**	55.78a	48.89bc	43.89d	**49.84A**
Mean	**56.28A**	**50.69B**	**41.25C**		**50.06A**	**45.28B**	**40.06C**	

Mean values in the same column of different treatment followed by the same capital liters are non -significant at 5% probability.** Mean values in the same row of different salinity levels followed by the same capital liters are non-significant at 5% probability.*** Mean values in each column and row followed by small liters are non-significant at 5% probability.

Table (4): Effect of magnetic seawater dilution and bio-fertilizer on fresh and dry Biomass of *Dalbergia sissoo* seedling during 2016/2017 and 2017/2018 seasons.

Salinity Treatments	fresh biomass (g)							
	First season; 2016/2017				Second season; 2017/2018			
	Nile water	2000	4000	Mean	Nile water	2000	4000	Mean
Control	**37.32d**	**30.40g**	**24.81h**	**30.84C**	**21.21e**	**18.87f**	**16.50g**	**20.04C**
Magnetization	**42.88b**	**35.32e**	**31.34f**	**36.51B**	**30.41b**	**25.88c**	**21.42de**	**28.15B**
Biofertilizer	**43.14b**	**36.00e**	**31.64f**	**36.93B**	**30.73b**	**26.60c**	**22.46d**	**26.60B**
Magnetization + Biofertilizer	**47.07a**	**41.62c**	**35.28e**	**41.32A**	**36.37a**	**31.04b**	**26.70c**	**31.37A**
Mean	**42.60A**	**35.84B**	**30.77C**		**29.68A**	**25.60B**	**21.77C**	
	dry biomass (g)							
Control	**11.62f**	**9.97h**	**8.00j**	**9.86D**	**8.95f**	**7.46h**	**4.80i**	**7.07C**
Magnetization	**14.46bc**	**11.87ef**	**9.55i**	**11.96C**	**12.70b**	**10.43d**	**8.38g**	**10.50B**
Biofertilizer	**14.67b**	**12.94d**	**10.46g**	**12.70B**	**12.81b**	**10.03e**	**8.51g**	**10.45B**
Magnetization + Biofertilizer	**17.75a**	**14.18c**	**12.03e**	**14.65A**	**14.41a**	**11.25c**	**9.10f**	**11.60A**
Mean	**14.63A**	**12.24B**	**10.01C**		**12.22A**	**9.80B**	**7.70C**	

* Mean values in the same column of different treatment followed by the same capital liters are non -significant at 5% probability.** Mean values in the same row of different salinity levels followed by the same capital liters are non-significant at 5% probability.*** Mean values in each column and row followed by small liters are non-significant at 5% probability.

B. Chemical composition

1. Total Chlorophylls

Table (5) indicated that salinity levels in irrigation water significantly decreased total chlorophylls compared with control; it holds in both seasons and has taken the same concept approximately. Considering the effect of magnetization and bio fertilization either individually or together resulted in an increase in total chlorophylls compared with non-magnetized or biofertilizer. Indicated that the maximum values were 2.21 and 2.20 mg g^{-1} in the plants irrigated with Nile water combined with treatments of magnetization plus biofertilizer while the lowest ones were 1.17 and 1.76 mg g^{-1} in those irrigated with 4000 $mg1^{-1}$ saline water in combination with non-magnetic or biofertilizer. The seedling irrigated with saline water at a level of 2000 $mg1^{-1}$ and combined with magnetic or biofertilizer either alone or with together recorded increases in total chlorophylls as a percentage of 8.00, 18.99 and 31.65 % over control in the first season, respectively.

2. Total carbohydrates:

Data presented in Table (5) indicated that salinity levels in irrigation water severely depressed total carbohydrates in the stem of *Dalbergia sissoo* seedlings in which the mean values were 18.93 and 17.03 %, referring to 2000 and 4000 $mg1^{-1}$ salinity compared with those of non-saline water, on the other hand, expose the plants to magnetized seawater and treatment of bio fertilization cleared increased total carbohydrates more than control. Furthermore, magnetic field alongside biofertilizer recorded the maximum values of 21.3 and 21.73 % in both seasons, respectively. Followed by those treated with biofertilizer 19.90 and 20.50 % in both seasons.

Concerning the interaction, it is evident that the plants irrigated with Nile water and treated with magnetized devices plus biofertilizer recorded the highest values of total carbohydrates 25.20 and 25.00 % in two seasons, respectively and the lowest one produced from the irrigated plants with saline water at a level of 4000 $mg1^{-1}$ and did not expose to either magnetic field or biofertilizer where the values were 14.70 and 14.50 % in both seasons, respectively. Therefore, exposure the plants to magnetized water treatment either non-saline or salinized and biofertilizer ameliorated total carbohydrates in the stem of *Dalbergia sissoo* seedlings. Meaning that both of them improved the tolerance of salt stress.

The former obtained results of total chlorophylls and carbohydrates were in the same line of **Alssefat (2006)** on *Khaya senegalensis* showed that salinity stress reduced total carbohydrates in stems also; magnetic field enhanced total chlorophylls and total carbohydrates in agreement with **Al-Khazan and Abdullatif (2009)** on Jojoba.

Concerning the effect of biofertilizer, the current results were in harmony with **Mohsen *et al.* (2016)** on lettuce plants and **Grzesik *et al.* (2017)** on (*Salix viminalis L.*)**,** all of them which stated that all different biofertilizer treatments considerably increased chlorophylls content and total carbohydrates.

3. Proline

As shown in Table (5) the obtained results revealed that salinity in water irrigation increased proline content in which the mean values were 0.90, 1.25 and 1.36 mg/100g in the first season and they were 0.83, 1.22 and 1.38 mg/100g in the second one in the plants irrigated with control and saline water at levels of 2000 and 4000 $mg1^{-1}$, respectively regardless the effect of magnetic water or biofertilizer.

Table (5) cleared that exposure of the plants to the magnetic field either alone or mixed with bio fertilization resulted in an increasing proline content more than those of control, where the mean values were 0.99, 1.11, 1.22 and 1.36 mg/100g in the first season. While values were 0.94, 1.09, 1.25 and 1.29 mg/100g in the plants of non-magnetic, magnetic alone, biofertilizer single and magnetic along biofertilizer in both seasons, respectively.

The interaction among salinity effect and treatments of both magnetization and bio fertilization cleared that the highest values of proline ascribed to the treatment of high salinity combined to exposure magnetic water plus biofertilizer since the mean values were 1.5 and 1.46 mg/100g in both seasons, respectively. Conversely, the minimum values correlated with non-magnetic or non-biofertilizer combined with Nile water where the lowest values were 0.75 and 0.67 mg/100g in both seasons, respectively.

Considering the effect of biofertilizer, it is cleared that the plants irrigated with saline water at levels 2000 or 4000 $mg1^{-1}$ and biofertilizer exhibited increases in proline content better than control.

Similar results were found by **Soliman *et al.* (2015)** on *Moringa peregrine* they showed that proline content increased in leaves with increasing the salinity. **Sarhan *et al.* (2020)** on *Swietenia macrophylla* found that at any level of salinity the treatment of magnetization with or without biofertilizer increased the proline content in leaves. This in agreement with the current study.

Table (5): Effect of magnetized seawater dilution and bio-fertilization on total chlorophylls (A+B), total carbohydrates and proline in leaves of *Dalbergia sissoo* during 2016/2017 and 2017/2018 seasons.

Salinity / Treatments	Total chlorophylls (A+B) (mg g^{-1} f. w.)							
	First season; 2016/2017				Second season; 2017/2018			
	Nile water	2000	4000	Mean	Nile water	2000	4000	Mean
Control	1.58ef	1.38g	1.17h	**1.38D**	1.65d	1.40e	1.26f	**1.44D**
Magnetization	1.86d	1.70e	1.30g	**1.62C**	1.86c	1.38ef	1.34ef	**1.53C**
Biofertilizer	2.00bc	1.88cd	1.55f	**1.81B**	2.05b	1.78c	1.45e	**1.76B**
Magnetization + Biofertilizer	2.21a	2.08b	1.63ef	**1.97A**	2.20a	2.06b	1.62d	**1.96A**
Mean	**1.91A**	**1.76B**	**1.41C**		**1.94A**	**1.66B**	**1.42C**	
	Total Carbohydrates % in stem							
Control	20.60d	17.20g	14.70h	**17.50D**	20.80d	18.00g	14.50i	**17.77D**
Magnetization	21.20c	19.00e	17.50g	**19.23C**	22.60c	18.00g	16.10h	**18.90C**
Biofertilizer	23.00b	19.30e	17.40g	**19.90B**	23.50b	20.00e	18.00g	**20.50B**
Magnetization + Biofertilizer	25.20a	20.20d	18.50f	**21.30A**	25.00a	21.00d	19.20f	**21.73A**
Mean	**22.50A**	**18.93B**	**17.03C**		**22.98A**	**19.25B**	**16.95C**	
	Proline (mg/100g)							
Control	0.75g	1.00f	1.23d	**0.99D**	0.67g	0.96de	1.20c	**0.94D**
Magnetization	0.80g	1.22d	1.31cd	**1.11C**	0.73f	1.15c	1.39b	**1.09C**
Biofertilizer	0.96f	1.30d	1.40bc	**1.22B**	0.91e	1.37b	1.48a	**1.25B**
Magnetization + Biofertilizer	1.10e	1.47ab	1.50a	**1.36A**	1.00d	1.40b	1.46a	**1.29A**
Mean	**0.90C**	**1.25B**	**1.36A**		**0.83C**	**1.22B**	**1.38A**	

* Mean values in the same column of different treatment followed by the same capital liters are non-significant at 5% probability.** Mean values in the same row of different salinity levels followed by the same capital liters are non-significant at 5% probability.*** Mean values in each column and row followed by small liters are non-significant at 5% probability.

4. Nutrient elements :

4.1. Nitrogen N (%) in leaves.

From the results of Table (6), it can be observed that salinity levels of 2000 and 4000 $mg1^{-1}$ decreased N % due to salinity in irrigation water and the values of N % content were 1.36 and 1.01 % compared with control which recorded 1.51 and 1.54 in both seasons, respectively and the differences were significant in between.

The plants irrigated with magnetized seawater treatments and biofertilizer it is cleared from data existed in Table (6) that clear increases N % occurred in leaves, attributed to exposure the plants to magnetized seawater and biofertilizer treatments either individually or plus together since the values were 1.22, 1.41 and 1.57 % in the first season while 1.13, 1.36 and 1.56 % in the second one, respectively.

The interaction between salinity and both of magnetized seawater or biofertilizer it is clear from the obtained results that the highest values of N % content were 1.81 and 1.80 % in both seasons exhibited in seedlings irrigated with Nile water as control combined with the exposure to magnetic field plus bio fertilization and the minimum values of N content were 0.77 and 0.86 % in both seasons referring to irrigating the plants with 4000 $mg1^{-1}$ saline water and did not treat with either biofertilizer or exposure to the magnetized field. Furthermore, the plants irrigated with magnetized water separately or mixed with biofertilizer together and irrigated with 2000 $mg1^{-1}$ saline water produced increasable values of N % in leaves content, as well as those treated with biofertilizer alone, gave the increasing by 25.42 % over control.

4.2. Phosphorus P (%) in leaves.

As cleared in Table (6) it can be concluded that P % content in leaves significantly decreased to 0.79 and 0.68 % due to 2000 or 4000 $mg1^{-1}$ saline water. While the control gave mean values of 0.81 and 0.92 % in both seasons respectively. It is also, noticed that the magnetization or bio fertilization and the mixture with together have taken the meaning values of 0.58, 0.66, 0.86 respectively and 0.97 %, In the control.

Besides, the maximum value of P % were 1.00 and 1.19 % in both seasons recorded in the plants irrigated with Nile water combined with magnetization plus biofertilizer and the lowest one 0.50 and 0.55 % produced in plants irrigated with 4000 $mg1^{-1}$ saline water in combination with non-biofertilizer or non-magnetized. It can be also noticed that the plants exposed to magnetic field either individually or mixed with biofertilizer and irrigated with 2000 $mg1^{-1}$ saline water declared an increase in P % content over control as well as bio fertilization individually increased P % over control.

It is evident that exposure of the plants to magnetized water and treated by biofertilizer and both of them restricted the injurious of salinity stress and improved the uptake of essential nutrient elements.

Table (6): Effect of magnetized seawater dilution and bio fertilization on N, P and K % in leaves of *Dalbergia sissoo* during 2016/2017 and 2017/2018 seasons.

Salinity	N (%) in leaves							
	First season; 2016/2017				Second season; 2017/2018			
Treatments	**Nile water**	**2000**	**4000**	**Mean**	**Nile water**	**2000**	**4000**	**Mean**
Control	1.18de	0.98f	0.77g	**0.97D**	1.25e	1.00fg	0.86i	**1.03D**
Magnetization	1.46c	1.30d	0.90f	**1.22C**	1.46c	0.98gh	0.94h	**1.13C**
Biofertilizer	1.60b	1.48c	1.15e	**1.41B**	1.65b	1.38d	1.05f	**1.36B**
Magnetization + Biofertilizer	1.81a	1.68b	1.23de	**1.57A**	1.80a	1.66b	1.22e	**1.56A**
Mean	**1.51A**	**1.36B**	**1.01C**		**1.54A**	**1.25B**	**1.018C**	
				P (%) in leaves				
Control	0.65d	0.58e	0.50f	**0.58D**	0.74e	0.60g	0.55g	**0.63D**
Magnetization	0.71d	0.70d	0.57e	**0.66C**	0.85d	0.74e	0.67f	**0.75C**
Biofertilizer	0.90b	0.87b	0.80c	**0.86B**	0.93c	0.86d	0.85d	**0.88B**
Magnetization + Biofertilizer	1.00a	1.02a	0.88b	**0.97A**	1.19a	1.10b	0.90cd	**1.06A**
Mean	**0.81A**	**0.79A**	**0.68B**		**0.92A**	**0.82B**	**0.74C**	
				K (%) in leaves				
Control	1.02d	0.71f	0.61g	**0.78D**	1.10g	0.85h	0.76i	**0.90D**
Magnetization	1.10c	0.80e	0.60g	**0.83C**	1.20f	1.32e	1.40d	**1.31C**
Biofertilizer	1.27ab	1.21b	1.10c	**1.19B**	1.62c	1.43d	1.10g	**1.38B**
Magnitization + Biofertilizer	1.33a	1.30a	1.10c	**1.24A**	2.10a	1.90b	1.60c	**1.87A**
Mean	**1.18A**	**1.01B**	**0.85C**		**1.51A**	**1.37B**	**1.22C**	

* Mean values in the same column of different treatment followed by the same capital liters are non -significant at 5% probability.** Mean values in the same row of different salinity levels followed by the same capital liters are non-significant at 5% probability.*** Mean values in each column and row followed by small liters are non-significant at 5% probability.

4.3. Potassium K (%) in leaves.

Data presented in Table (6) indicated that there is a general tendency to a progressive decrease K % in leaves content because of increasing salinity concentrations in irrigation water at levels of 2000 or 4000 $mg1^{-1}$ where the mean values were 1.01 and 0.85 % in the first season, while the values were 1.37 and 1.22 % in the second season compared to control, respectively. meantime the salinity resulted in diminishing uptake potassium from saline soil solution led to reducing it in leaves, conversely, magnetic seawater treatment or biofertilizer raised the uptake of K+ consequently it increased in leaves.

From the aforementioned results, it could be confirmed that salinity levels in irrigation water prevented or leased the absorption of nutrients element such as N, P and K consequently reduced in leaves of *Dalbergia sissoo* seedlings. Conversely, magnetic water treatment either salinized or none salinized resulted in counteracted the harmful of salinity stress and alleviation the injurious of salinity in soil solution led to more absorption for these nutrients elements from root to leaves. On the other hand, bio fertilization associated with exceeding the absorption of nutrients elements from the saline soil solution and exported to leaves. Hence it is very important the exposing water irrigation to a magnetic field before starting the irrigation practice especially saline water and there is a synergetic effect between magnetic and biofertilizer treatment.

The former results are in harmony with, **Mazhar *et al.* (2011)** *on Jatropha curcas* and **Sherbeen (2018)** on *Sweitenia macrophylla* they found that increasing concentration of salt treatments decreased the NPK% in the plants. As for the obtained results due to magnetization effect and stated by many scientists such as **Maheshwari and Grewal (2009)** on tomato found that the magnetic treatment significantly increased the N, P, K content, **Khazan and Abdullatif (2009)** on Jojoba have reported that Magnetic water resulted in increased N, P, and K uptake. The former results of the effect of bio fertilization have taken the same line of **Anand *et al.* (2015)** who showed that Cyan bacterial isolates in consortium with Maize crop showed a significant increase in total nitrogen and **Mohsen *et al.* (2016)** the results revealed that the addition of different concentrations of two cyanobacterial extracts (*Anabaena oryzae* and *Nostoc muscorum*) for lettuce plants indicated that there were significant differences among all treatments in NPK contents in both seasons and **Sarhan et al. (2020)** on *Swietenia macrophylla* reported that magnetic treatment and biofertilizer ameliorated and raised N, P and K% content in leaves.

4.4. Sodium content (Na)

As obtained results from Table (7), it is cleared that salinity levels in water irrigation induced significantly excessive values of sodium content in leaves where the mean values were 0.63, 1.28 and 1.56 % in the first season and 0.69, 1.58 and 1.76 % in the second one in the seedling of *Dalbergia sissoo* irrigated with Nile water, 2000 and 4000 $mg1^{-1}$ salinity, respectively irrespective of the impact of magnetization and bio fertilization treatments.

Regarding the effect of magnetized system and biofertilizer it is evident from data listed in Table (7) that sodium content in leaves increased significantly in seedling irrigated with non-magnetized water treatment or non-biofertilizer but when the seedlings treated with the magnetic device alone or plus biofertilizer acquired beneficial and decreased Na content in which this depression equilibrium 21.09, 11.72 and 7.31 % less than control in the first one and the percentage of the decrease were 13.29, 7.70 and 4.20 % in the second one in the plants exposed to magnetized seawater plus biofertilizer, individual bio fertilization and magnetic device separately, respectively. And the differences were significant among the treatments in both seasons.

The interaction among the effect of salinity in combination with the treatments of magnetization and bio fertilization the obtained results cleared that the lowest values of Na content in leaves were 0.60 and 0.63 % in both seasons, revealed in the plants irrigated with non-saline water and exposed to magnetic along biofertilizer and the highest values were 1.72 and 1.90 % in both seasons referring to saline water irrigation at the level of 4000 $mg1^{-1}$ and non-magnetized or non-biofertilizer, moreover, the treatments of magnetization or bio fertilization resulted in decreases in Na+ content in the plants irrigated with the same level of salinity, it holds in both seasons. It is noteworthy that both magnetically and biofertilizer associated with reducing Na+ content meaning that both of them prevented or leased the absorption of Na+ content from the soil solution. Consequently, it reduced in leaves of the plant. The obtained results of salinity effect were in harmony with**, Alssefat (2006)** on *Khaya senegalensis* showed that reduction in Na percentages in leaves increased with increasing salinity **Mazhar *et al.* (2011)** on *Jatropha curcas* and **Sherbeen (2018)** on *Sweitenia macrophylla* cleared that Na % increased by increasing salinity levels. Regarding the effect of magnetization obtained from the current study were in agreement with **Maheshwari and Grewal (2009)** on tomato plants noticed that using magnetized water reduced sodium percentage in tomato leaf.

Zlotopolski (2017) showed that MWT reduced-sodium concentrations in soil by leaching it below root zones. This could explain why plants treated by MWT had less leaf sodium levels compared to non-MWT.

Table (7): Effect of magnetic seawater dilution and biofertilizer on Sodium content and K^+/Na^+ ratio in leaves of *Dalbergia sissoo* seedling during 2016/2017 and 2017/2018 seasons.

				Na^+ %				
Salinity	**First season; 2016/2017**				**Second season; 2017/2018**			
Treatments	**Nile water**	**2000**	**4000**	**Mean**	**Nile water**	**2000**	**4000**	**Mean**
Control	0.67h	1.46cd	1.72a	**1.28A**	0.75f	1.64d	1.90a	**1.43A**
Magnetization	0.63hi	1.35e	1.60b	**1.19B**	0.70g	1.62d	1.80b	**1.37B**
Biofertilizer	0.61i	1.27f	1.51c	**1.13C**	0.66h	1.60d	1.70c	**1.32C**
Magnetization + Biofertilizer	0.60i	1.02g	1.41d	**1.01D**	0.63h	1.47e	1.62d	**1.24D**
Mean	**0.63C**	**1.28B**	**1.56A**		**0.69C**	**1.58B**	**1.76A**	
				K^+/Na^+ ratio				
Control	1.52c	0.48g	0.35h	**0.60C**	1.46cd	0.51de	0.40g	**0.62D**
Magnetization	1.74b	0.60f	0.37gh	**0.70C**	1.71c	0.81ef	0.77ef	**0.95C**
Biofertilizer	2.08ab	0.95e	0.72ef	**1.05B**	2.45b	0.90e	0.64ef	**1.05B**
Magnetization + Biofertilizer	2.21a	1.27d	0.78cd	**1.22A**	3.33a	1.29d	0.98e	**1.50A**
Mean	**1.87A**	**0.78B**	**0.55C**		**2.18A**	**0.86B**	**0.70C**	

* Mean values in the same column of different treatment followed by the same capital liters are non -significant at 5% probability.** Mean values in the same row of different salinity levels followed by the same capital liters are non-significant at 5% probability.*** Mean values in each column and row followed by small liters are non-significant at 5% probability.

The Ratio of potassium and sodium content.

As shown in table (7) it can be concluded that the ratio of K^+/Na^+ significantly decreased as a result of irrigating the plants of *Dalbergia sissoo* with saline water at different concentrations of 2000, 4000 $mg1^{-1}$ compared to control in which the mean values were 0.78 and 0.55 % respectively in the first season and the values were 0.86 and 0.70 % in the second one. Conversely as regards the impact of magnetization and bio fertilization ratio of K^+/Na^+ significantly increased with exposure the plants to a magnetic field with or without-bio fertilization in which the values were 1.22 and 0.70 % respectively in the first season, besides, bio fertilization exceeded the ratio of K^+/Na^+ 1.05 %. In the second season. While the control recorded 0.6 and 0.62 in both seasons, respectively.

These results may be due to the effect of conditioner water on removal salts out of the Na^+ ion for K^+ absorption leading to an increasing K^+/Na^+ ratio, similar results obtained by **Khattab *et al.* (2000)** on

Gladulus plants, the increases K^+/Na^+ ratio because of treating the plants by biofertilizer may be due to enhancing the synthesis of protein, RNA and DNA formation, by the finding of **Mostafa (2002)** on *Calendula Officinalis* stated that the magnetic treating of saline water was the most efficient method in increasing the K^+/Na^+ ratio in the leaves. **Viegas *et al.* (2004)** found that salinity stress reduced K contents of *Prosopis juliflora* seedlings shoot, and reduced K^+/Na^+ ratio in agreement with the herein results and **Garcia *et al.* (2007)** on maize plants showed that the increase of soil salinity by saline water irrigation resulted in decreased the reaction K^+/Na^+ ratio.

4.Conclusion

It could be concluded that the current study cleared that seedlings of *Dalbergia sissoo* tolerated salinity level up to 4000 $mg1^{-1}$ and the magnetization or bio fertilization ameliorated most of the growth parameters and enhanced the status of chemical constituents producing healthy seedlings.

5. Acknowledgement

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Arabic abstract المستخلص العربي

تأثير مغنطة ماء البحر والتسميد الحيوي علي النمو والمحتوي الكيماوي لشتلات السرسوع

عاطف زكريا سرحان[1] ، أميرة شوقي سليمان[2] ،عصام نجيب الدين الأطرش[3] ، احمد محمد سكران[3]
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أجريت هذه التجربة لدراسة تأثير مغنطة ماء البحر المخفف وكذلك التسميد الحيوي علي النمو والمكونات الكيماوية لشتلات السرسوع خلال موسمين ناجحين 2017/2016 و2018/2017 بمحطة بحوث البساتين بالقناطر الخيرية – مصر.حيث استخدمت ثلاث تخفيفات من ماء البحر (2000-4000-5000) جزء في المليون بالإضافة الي (ماء نهر النيل) وكذلك استخدمت أربعة معاملات هي (المغنطة بمفرده ، تسميد حيوي بالسيانوباكتيريا خليط من طحلبي (*Anabaena sp*. and *Nostoc sp*) ، (التسميد الحيوي والمغنطة معا) ، والكنترول (بدون مغنطة وبدون تسميد حيوي).

وقد اظهرت النتائج المتحصل عليها أن المستويات المختلفة من الملوحة قد قللت من النمو الطولي وقطر الساق والمساحة الورقية وطول الجذر والكتلة الحيوية الطازجة والجافة بينما المستوي العالي من الملوحة 5000 جزء في المليون سواء بمفرده او مع المغنطة او التسميد الحيوي او الاثنين معا سبب موت الشتلات .ايضا الملوحة قد سببت نقص في الكلورفيلات الكلية والكربوهيدرات الكلية في الساق وعلي العكس زاد المحتوي من البرولين بالأوراق .وكذلك قلت نسبة النيتروجين والفوسفور والبوتاسيوم في حين زاد محتوي الصوديوم وبالتالي قلت النسبة بين البوتاسيوم للصوديوم .

معاملة النباتات بالماء الممغنط المالح او الغير مالح زاد معنويا من النمو الطولي وقطر الساق والمساحة الورقية وطول الجذر والكتلة الحيوية الطازجة والجافة بالمقارنة بالكنترول ايضا المعاملة بالتسميد الحيوي بمفرده او مع المغنطة نتج عنه زيادة في الكلورفيلات الكلية والكربوهيدرات الكلية والبرولين وامتصاص عناصر النيتروجين والفوسفور والبوتاسيوم في حين قل امتصاص الصوديوم وبالتالي زادت النسبة بين البوتاسيوم للصوديوم بالأوراق .

بناءا عليه اوضحت الدراسة الحالية أن شتلات السرسوع لا تتحمل مستوي ملوحة تزيد عن 4000 جزء في المليون وان المغنطة او التسميد الحيوي حسنا معظم قياسات النمو والمحتوي الكيماوي وانتجا شتلات جيدة.