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Enhancing of faba bean growth and germination under salinity levels

By

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Abstract

A pot experiment was carried out to evaluate the effect of moringa leave extract and gibberellic acid on seed germination and plant growth of faba bean grown in a sandy soil under salinity levels. The effect of water salinity on growth response of faba bean (Vicia faba L) was investigated. The plants were irrigated by using saline water with different regimes (tab water; Qarun Lake water diluted with the tab water until reached 500, 1000 and 1500 ppm) for 60 days. Results showed that seed soak with gibberellic acid (GA_3 300 ppm) and moringa leaves extract (MLE 1:30) increased germination percentage as compared with the control. The germination percentage recorded 100% after 5 days compared with control which recorded 80 %. On the other hand, Soil EC, soluble ions and pH were increased as a result of increasing salinity levels of irrigation water after faba bean harvesting as compared to the control. In addition, both fresh and dry weights of faba bean plants were decreased with increasing water salinity levels.

Moreover, the values of N, P and K content in faba bean plant grown in a sandy soil were affected by water salinity. It is evident that the decreasing in NPK content was associated by increasing water salinity. Also, the increment of salinity levels led to decrease N, P and K uptake compared to the control. The lowest values of these nutrients uptake were observed by the highest levels of salinity (1500 ppm) treatment. On the other hand, it can be noticed that the addition of MLE and GA_3 as foliar sprays had positive effect on increasing the dry weight, macronutrients content and uptake of faba bean plant grown under salinity stress. The highest increase of the studied parameters was given by the application of Moringa leaves extract as a foliar spray.

Key words: Faba bean- Salinity - Moringa leaves extract- Gibberellic Acid.

INTRODUCTION

Saline water was previously considered unusable for irrigation especially for sensitive plants. But it can be used successfully to grow crops under certain conditions. Research efforts during the past two decades have brought into practice some large irrigation schemes which depend on saline water. Irrigated agriculture using saline water can lead to salt accumulation in soil profile, reduction in growth and yield anddeterioration of soil resource, if proper management practices are not adapted .Water uptake is restricted by salinity due to the high osmotic potential in the soil and high concentrations of specific ions that may cause physiological disorders in the plant tissues, **Ould et al., (2007).**Faba bean is one of the major cool season grain legume crops produced worldwide. It is mainly grown for its high protein content as food and feed. Growth of faba bean is very sensitive to salinity stress. The salt tolerance of Vicia faba L. was correlated with higher accumulation of ionic and osmotic solutes in salt-tolerant than that of salt-sensitive plants, **Ismail and Azooz (2002).** Recently attention was given to use other new technologies of combating salinity, among them some using halophytes, as a new approach to minimize the harmful effect of salinity through nutrient management. One approach is the use of foliar sprays for increasing plant tolerance to salinity by alleviating Na^+ and Cl^- injury to plants **El-Fouly *et***

***al., (*2004).** For examples gibberellic acid (GA_3) is a naturally occurring growth hormone which controls the extremely important aspects of plant growth through regulation of several growth processes such as seed germination, stem elongation, uniform flowering, and increased number of flowers, **Ayyub (2013).** It is possible that GA_3 had the potential to accelerate the nutrients partitioning towards cells and active growth sites and concomitantly increases those nutrients absorption *via* increased root potential, and finally intensifies minerals and their related bio-molecules accumulation in shoots especially new leaves and apical shoots passing active growth and development. Moreover, GA_3 increased the absorption and tissue accumulation of N, P, K and micronutrients **(Eid and Abou-Leila, 2006).** Also, Moringa oleifera is the most nutrient rich plant yet discovered. Moringa provides a rich and rare combination of nutrients, amino acids, antioxidants, anti aging and anti-inflammatory properties used for nutrition and healing, **Fahey (2005).** The aim of this study was to enhancing of faba bean growth and germination under salinity levels.

Materials and Methods

A Pot experiment was carried out at the farm of Faculty of Agriculture, Al- Azhar University, Nasr city Cairo Egypt. Its aims to evaluate the effect of moringa leave extract (MLE) 1:30 and gibberellic acid (GA_3)300 ppm as primed as well as sprayed materials on seed germination of faba bean plant (Vicia faba L) grown in a sandy soil under salinity levels. GA_3 and MLE were prepared and the seeds were soaked in the solution for 24 hours. The saline water (from Qarun Lake 21504 ppm) was diluted with tap water to reach the desired concentration. The salinity levels of irrigation water were; tab water (256ppm), 500, 1000 and 1500 ppm; Control, S1, S2 and S3, respectively. Plastic pots filled with 7 kg sandy soil. 5 seeds of faba bean were planted in every pot and moisture content of pots was kept approximately at field capacity. The germination percentages were determined after 5 and 8 days.GA3 and MLE were sprayed every two weeks up to 60 days of planting. Control plants sprayed with tab water. The cultivated plants were fertilized with ammonium sulfate, super phosphate and K- sulfate according to the general recommendation dose of Ministry of Agriculture. The soil was mixed with compost (70g /pot) before planting. After 60 days from planting, faba bean shoots of each treatment were cut just one cm above the soil surface and prepared for analysis. Soil samples from each pot were taken after harvesting, air- dried, crushed and passed through a 2 mm sieve and kept for soil analysis. The characteristics of the investigated soil, i.e. Particle size distribution, Bulk density, Soil pH, EC, soluble cations and anions, OM, CEC, available N, P,K were determined**(Page et al., 1982 and Klute,1986).**Micronutrients (Fe, Zn, Mn and Cu) in clear digested solution were determined using Perkin Elmer Inductivity Coupled Spectrophotometer Plasma (ICP). N, P and K were estimated in the plant digest, **Cottenie *et al.* (1982)**.The results of soil and used materials are presented in Table 1 and 2.

Preparation of moringa leaves extract

An amount of 20 g of air dried moringa leaves was mixed with 675 ml of 80 % ethanol as suggested by**Makker and Becker (1996).** The suspension was ground and stirred using a homogenizer to help maximize the amount of the extract. The solution was then filtered by wringing the solution using a mutton cloth. The solution was re-filtered using No. 2 Whatman filter paper. Using method developed by **Fuglie (2000),** the extract was diluted with tab water at a ratio of 1:30 (v/v) and then sprayed directly onto plants. An amount of 25 ml (application rate) of the solution was applied per plant. . But moringa leaves extract for seed priming as prepared by the same method by replacing the amount of ethanol by tab water.

Table (1) Some physical and chemical properties of the used soil

Parameter	Value
Some physical properties	
Sand %	75.80
Silt %	19.50
Clay %	4.70
Textural class	Loamy sand
Field capacity (F C) %	11.00
Chemical properties	
pH	7.80
EC(1:2.5) dS/m	1.90
OM %	0.34
CEC meq/100 g soil	2.65
Soluble ions meq/L(1:2.5)	
Ca^{++}	2.20
Mg^{++}	3.80
Na^{+}	9.70
K^{+}	0.40
$CO_3^{=}$	0.00
HCO_3^{-}	2.18
Cl^{-}	8.90
$SO_4^{=}$	5.02
Available macro nutrients mg/kg	
N	32.00
P	11.00
K	48.80

Table (2 a) Some chemical properties of the used compost

pH	EC dS/m	O.C %	OM %	C/N ratio	Total macro nutrients %		
					N	P	K
6.9	3.96	18.5	31.81	17.7	1.8	0.9	1.11

Table (2 b) Some chemical components of *Moringa* leaves extract.

N	P	K	Ca	Mg	Fe	Zn	Mn	Cu
%					mg.kg^{-1}			
2.2	1.25	1.87	2.66	0.70	468	54.6	76.8	6.7

Results and Discussion

Seed germination

The primed seeds give earlier, more uniform and sometimes greater germination and seedling establishment and growth, **Bradford (1986).** The data presented in Table(3) showed that seed soak with gibberellic acid (GA_3) and moringa leaves extract (MLE) increased germination percentage as compared with the control. The germination percentage recorded 100% after 5 days compared with the control which recorded 80 %. Similar increases in germination when seeds were soaked at similar concentrations had been observed by **Cetinbas and Koyuncu (2006).** Also **Dhupper (2013)** showed that seeds treated with gibberellic acid achieved maximum germination and seedling dry weight especially in Acacia nilotica and Prosopiscineraria followed by Albizzia lebbeck. For all species, the effect of gibberellic acid is species dependent, rarely better than the control. On the other hand, germination of seeds influenced by salinity stress, in this research the results indicated that the increase of irrigation water salinity decreases the final germination percentage. In this regard, **Fowler, (1991)** observed that seed often fails to germinate in salt affected soils, the reduction in rate of seed germination and final germination percentage were observed under high salt contents . Moreover, the seeds reduction increases by increasing salinity of irrigation water and reaches its maximum at S3 (1500ppm) salinity level. **Shohani and Mehrabi (2014)** stated that seed germination significantly decreased by increasing salinity levels of irrigation water.

Regarding to the effect of GA_3 and MLE on seed germination under salinity levels, data in Table (3) showed that seed priming with GA_3 and MLE were the most effective in boosting up germination percentage and succeeding seedling growth under chilling conditions. Better performance of seedlings was MLE than GA_3. The germination percentage recorded 100% after 5 days at seeds treated with GA_3 +tab water, MLE + tab water, MLE + salinity water (500ppm) and MLE + salinity water (1000 ppm) compared with the control. This finding was in agreement with those obtained by **Irman et al., (2014)** who found that MLE is more pronounced positive effect on germination. Generally, all the seed priming treatments were effective in improving germination and seedling growth attributes of faba bean over the control. However, MLE followed by GA_3 emerged as the most effective materials. The main mechanisms in this regard were the induction of an anti oxidative system together with increased chlorophyll contents, ascorbic acid, and soluble phenolics contents. The results strongly support the view that seed priming with MLE is economical and can be effectively used to improve faba bean growth under the same conditions. In this concern **(Noman, 2008)** found that seed primed with moringa leaves extract (MLE) diluted to 30 times with tap water increased the germination speed and spread and seedling vigor under cool conditions.

Table (3) The germination percentage (%) of faba bean treated with soaking materials under salinity levels.

Treatments		**% Germination rate**	
Soaking materials	**Irrigation resource**	**After 5 days**	**After 8 days**
Control		80	100
GA_3 300 ppm	**T W**	100	100
MLE 1:30 w/v		100	100
T W	**S1**	80	100
	S2	80	80
	S3	60	80
GA_3 300 ppm	**S1**	100	100
	S2	80	100
	S3	60	80
MLE 1:30 w/v	**S1**	100	100
	S2	100	100
	S3	80	80

TW=Tab Water S1=500 ppm natural saline water

S2 =1000 ppm natural saline water S3=1500 ppm natural saline water

MLE= Moringa Leaves Extract GA_3= Gibberellic Acid

Chemical properties:

The data presented in Table (4) showed that, soil electrical conductivity increased as a result of increasing salinity levels of irrigation water as compared to the control. The same trend was found in soil pH. This finding is in agreement with those obtained by **Ragab et al., (2008)** who found that the significant increase in soil EC was proportional to the salts concentration of irrigation water. The highest value was 3.6 dS m^{-1} for S3treatment (1500 ppm) and the lowest one was found for soil irrigated with tab water (2.1 dS m^{-1}) compared with control.

Table (4) Some soil properties as affected by sprayed materials after faba bean harvest.

Treatments		pH	EC	Cations(meq/L)				Anions(meq/L)			
Sprayed materials	Irrigation resource		dS/m	Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	$HCO_3^{=}$	Cl^{-}	$SO_4^{=}$
Control		7.5	2.5	2.60	4.85	12.50	0.70	0.0	3.80	11.20	5.65
GA_3 300 ppm	T W	7.5	2.2	2.30	4.40	10.80	0.70	0.0	3.40	9.30	5.50
MLE 1:30 v/v	T W	7.6	2.1	2.20	4.00	9.90	0.60	0.0	4.60	8.90	3.20
T W	S1	7.5	2.8	2.77	5.78	14.20	0.78	0.0	6.20	13.00	4.33
	S2	7.6	3.1	3.11	6.13	15.30	0.82	0.0	6.40	13.30	5.66
	S3	7.8	3.5	3.17	6.80	16.20	0.82	0.0	6.60	14.60	5.59
GA_3 300 ppm	S1	7.6	2.7	2.70	5.60	12.90	0.67	0.0	5.11	13.20	3.56
	S2	7.6	2.9	2.50	5.90	14.80	0.80	0.0	6.20	13.50	4.30
	S3	7.7	3.4	2.90	6.70	16.20	0.80	0.0	7.80	14.30	4.50
MLE 1:30 v/v	S1	755	2.9	2.40	6.11	14.60	0.78	0.0	6.60	13.00	4.29
	S2	7.6	3.1	2.80	6.60	15.90	0.82	0.0	6.80	14.70	4.52
	S3	7.9	3.6	3.47	7.30	16.30	0.90	0.0	7.00	15.40	5.57

TW=Tab Water S1=500 ppm natural saline water

S2=1000 ppm natural saline water S3=1500 ppm natural saline water

MLE= Moringa Leaves Extract GA_3= Gibberellic Acid

Concerning the soluble cations and anions in the soil samples after faba bean harvest, data in Table (4) showed that, the concentration of soluble

Ca^{++}, Mg^{++}, Na^{+}, and K^{+} were increased as a result of irrigation with saline water. The highest values were found for the treatment of S3 (1500 ppm) which recorded 3.47, 7.3, 16.3, and 0.9 meq/L, respectively. While the lowest one found for soil irrigated with tab water. On the other hand, there is an increase in soluble anions by increasing the salinity levels of irrigation water. The highest values of soluble HCO^{-}_{3}, Cl^{-} and $SO^{=}_{4}$ were found for the treatment of S3 (1500 ppm) and recorded 7, 15.4 5.57 meq/L, respectively. This could be attributed to the fact that saline solutions increase the solubility of none readily soluble sulfates in soil media. While, the lowest values were recorded 3.4, 8.9 and 3.2 meq/L, respectively in soil irrigated with tab water. **Hassanein et al., (1993)** found that the distribution and concentration of most cations and anions were increased with increasing salt concentration in irrigation water.

Fresh and dry weight

Fresh and dry weight of faba bean plants grown in sandy soil samples under salinity levels are given in Table (5). The data revealed that both fresh and dry weights of faba bean plants were decreased with increasing salinity levels. In this point **Tester and Davenport (2003)** found that either salinity of soil and irrigation water causes disturbances in plant growth and nutrient balance. The data showed that addition of MLE and GA_3 had positive effect on increasing the dry weight of faba bean plant grown under salinity stress. The increase in fresh and dry weights of faba bean plants was influenced by salinity levels. The highest values of fresh and dry weight ranged from 61.53 to55.3 and 10.6 to 8.6 g/pot, respectively. Therefore the increasing percentages in faba bean fresh and dry weights were ranged between 14.58 to 2.98% and 27.71 to 3.61%, respectively. In this concern, **Ashraf and Iram (2002)** found that GA_3 treatment enhanced the vegetative growth of wheat growth under salinity stress. GA_3 treatment enhanced the deposition of Na^{+} and Cl^{-}

in both root and shoots of wheat plants under prevailing field conditions. It also caused a significant increase in photosynthetic activity in both lines at the vegetative stage of the crop. Also, **Mvumi et al., (2013)** showed that use of moringa leaf extract as a growth hormone will increase crop growth and yields. It was contain of zeatin, a cytokinin related hormone in the extract, which was responsible for the improved growth and yields. Finally, there is evidence that leaves fresh and dry weights increment is due to the accumulation of some biomolecules mainly responsible for cell division and subsequent enlargement and this leads to the thickened and larger leaves, **El-Naggar et al., (2009).** Also, it is interesting to note that spraying moringa leave extract as natural material can prevent nutritional disorders of plant growth under salinity conditions which leads to promote nutrients uptake.

NPK content

The obtained results in Table (6) showed that the values of N, P and K content in faba bean plant grown in a sandy soil were affected by water salinity. It is evident that the decreasing in NPK content associated by the increasing in water salinity in faba bean plant tissues as compared to the control. This is because higher salinity may affect different metabolic processes. The concentrations of soluble salts through their high osmotic pressures affect plant growth by restricting the uptake of water by plant roots. High salinity can also cause nutrient imbalances.

Table (5) Effect of sprayed materials on fresh and dry weight (g/pot) of faba bean plant grown in sandy soil under salinity levels.

Treatments		Fresh weight		Dry weight	
Sprayed materials	Irrigation resource	g/pot	% increase	g/pot	% increase
Control		53.70	100.0	8.30	100.0
$GA_3$300 ppm	T W	58.20	108.38	9.00	108.43
MLE1:30 v/v		61.53	114.58	10.60	127.71
T W	S1	46.40	86.40	8.11	97.71
	S2	40.20	74.86	7.60	91.57
	S3	38.75	72.16	7.30	87.95
$GA_3$300 ppm	S1	55.30	102.98	8.60	103.61
	S2	50.70	94.41	8.30	100.0
	S3	40.40	75.23	7.90	95.18
MLE1:30 v/v	S1	60.60	112.85	9.30	112.05
	S2	50.10	93.30	8.30	100.0
	S3	45.00	83.80	7.70	92.77

TW=TabWater S1=500 ppm natural saline water
S2=1000 ppm natural saline water S3=1500 ppm natural saline water
MLE= Moringa Leaves Extract GA_3= Gibberellic Acid

These data are in agreement with those obtained by **Abou El-Nour et al., (2005)** who found that increasing salinity reduced the content of free amino acids in wheat as a result of decreasing nitrate reeducate activity that plays an important role in conversion of nitrate to ammonium. The NPK content of faba bean leaves gradually decreased by increasing salinity levels to reach their lowest values at the highest level of salinity (1500 ppm).The highest values of NP and K content were 1.66, 0.18 and 1.5 % respectively. Therefore the decreasing percentages of NP and K content were 10.27, 18.18 and 9.64 % respectively. In this concern **Grattan and Grieve (1999)** cleared that effect of salinity on the content of some macro nutrients in plant tissue depend on the level of salinity, plant species (cultivar) and developmental stage of plant. Also, **Munns and Tester (2008)** stated that the reduced values of NPK observed under highest salinity level may be due to reduction in water uptake and the nutritional imbalance causing toxicities or deficiencies of ions. On the other hand, foliar application of MLE and GA3 increased concentration of N, P, and K in faba bean plant tissues as compared to the control. These results are in agreement with those obtained by **Srinivasan et al., (2013)** who found that increase in potassium contents of wheat leaves when MLE was exogenously applied to induce tolerance against salinity stress conditions. The increasing percentages of NP and K content were ranged from 40.54 to 2.7% and 72.37 to 13.64% and 8.43 to 2.41%, respectively. This is may be duo to MLE considered as a source of plant growth factors, antioxidants, β-carotene, vitamin C, minerals and antioxidant agents. So, foliar application of MLE enhanced accumulation of macronutrient (N, P and K) in plants, (**Nouman *et al.*, 2011**).

Table (6) Effect of sprayed materials on NPK content (%) of faba bean plant grown in sandy soil under salinity levels.

Treatments		N		P		K	
Sprayed Materials	Irrigation resource	values	% increase	values	% increase	Values	% increase
Control		1.85	100.0	0.22	100.0	1.66	100.0
GA3 300 ppm	T W	2.00	108.10	0.25	113.64	1.70	102.41
MLE 1:30 v/v		2.60	140.54	0.35	159.09	1.77	106.63
T W	S1	1.90	102.70	0.20	90.91	1.50	90.36
	S2	1.70	91.89	0.20	90.91	1.50	90.36
	S3	1.66	89.73	0.18	81.82	1.60	96.38
GA3 300 ppm	S1	2.00	108.11	0.20	90.91	1.80	108.43
	S2	1.90	102.70	0.22	100.0	1.70	102.41
	S3	1.70	91.89	0.20	90.91	1.70	102.41
MLE 1:30 v/v	S1	2.50	135.14	0.38	172.73	1.80	108.43
	S2	2.20	118.92	0.30	136.36	1.77	106.63
	S3	2.00	108.10	0.30	136.36	1.70	102.41

TW=Tab Water S1=500 ppm natural saline water

S2=1000 ppm natural saline water S3=1500 ppm natural saline water

MLE= Moringa Leaves Extract GA_3= Gibberellic Acid

NPK uptake

It is a known fact that ionic uptake by plants is controlled by the external and internal ionic concentration, selectivity and plant energy levels as well as water absorption. With regard to the uptake of N, P and K by faba bean plants grown in sandy soil under salinity levels, the data in Table (7) revealed that increasing of salinity levels were decreased N, P and K uptake, compared to the control. The lowest values of these ions uptake were observed by the highest levels of salinity at S3 (1500 ppm) treatment. The values of NP and K uptake by faba bean plants, irrigated with 1500 ppm saline water (S3), were 121.18, 13.14 and 116.8mg/pot for N, P and K, receptively. These data are in agreement with those obtained by **Mer et al., (2000)**who found that macronutrients uptake by barley and wheat plants was decreased as a result of high concentrations of salts. The decrement of nutrient uptake may be attributed to the high concentration of salts in the soil solution interferes with imbalanced absorption of essential nutritional ions by plants, (**Tester and Davenport, 2003**).

Concerning the NP and K uptake by faba bean plant grown in a sandy soil under salinity levels and treated with sprayed materials , data in Table(7) showed that the addition of MLE and GA_3 as foliar sprays gave positive effect with different degrees on macronutrients uptake. This is may be due to MLE contain a high concentration of macro and micro nutrients. In this concern **El-Fouly et al., (2002)**stated that foliar feeding with micronutrients could partially counteract the negative effect of salinity on nutrients uptake through improving root growth and prevented the nutritional disorders and consequently caused an increase for the uptake of nutrients by the roots. The results also indicated that the highest percent of increase in faba bean plants of NP and K uptake under salinity levels over the control treatment were observed at MLE associated with irrigated with

500 ppm saline water (S1). The values were 51.42, 94.08 and 21.5 % of N, P and K, respectively. Moreover, the increasing percentages of N and K uptake were ranged from 12.01 to 2.7 and 12.35 to 2.41 for GA_3 treatment irrigated with 500 ppm saline water (S1), respectively. But there is a decreasing in the percentage of P uptake under the same conditions. In this respect **Grattan and Grieve (1994)** reported that imbalances may result from the effect of salinity on nutrient availability, competitive uptake, transport or partitioning within the plant or may be caused by physiological interactivities of a given nutrient resulting in an increase in the plants internal requirement for that essential element.

It was interestingly noticed that the uptake of N, P and K by faba bean plants followed the same trend of N, P and K content. The highest increase was given by the application of Moringa leave extract under different salinity of water.

Table (7) Effect of sprayed materials on NPK uptake (mg/pot) by faba bean plants grown in a sandy soil under salinity levels.

Treatments		N		P		K	
Sprayed materials	Irrigation resource	values	% increase	values	% increase	values	% increase
Control		153.55	100.0	18.26	100.0	137.78	100.0
GA_3 300 ppm	T W	180.00	117.22	22.50	123.22	153.00	111.05
MLE 1:30 v/v		275.60	179.48	37.10	203.18	187.62	136.17
T W	S1	154.09	100.35	16.22	88.83	121.65	88.29
	S2	129.20	84.14	15.20	83.24	114.00	82.74
	S3	121.18	78.92	13.14	71.96	116.80	84.77
GA_3 300ppm	S1	172.00	112.01	17.20	94.19	154.80	112.35
	S2	157.70	102.70	18.26	100.00	141.10	102.41
	S3	134.30	87.46	15.80	86.53	134.30	97.47
MLE 1:30v/v	S1	232.50	151.42	35.34	194.08	167.40	121.50
	S2	182.60	118.92	24.90	136.36	146.91	106.63
	S3	154.00	100.29	23.10	126.50	130.90	95.00

TW=Tab Water **S1=500 ppm natural saline water**
S2=1000 ppm natural saline water **S3=1500 ppm natural saline water**
MLE= Moringa Leaves Extract **GA_3= Gibberellic Acid**

Conclusion

Seed germination and plant growth are considered the most important sensitive stages to stress, so it is more important to find any technique for enhancing plants to tolerance salinity stress. The present experiment was developed in order to evaluate salinity effects and plant growth regulatorsGA3 and MLE on seed germination and growth of faba bean plant. Results of this study showed that the use of saline irrigation water increase root zone salinity and affects certain faba bean growth and germination. However, macro nutrients content were affected by the high levels of salinity. In addition, increasing salinity levels of irrigation water resulted in decreasing of all measured parameters of faba bean plant. On the other hand, addition of GA_3 (300 ppm) and MLE (1:30) as soaking or foliar application have positive effect on growth and nutrients uptake of faba bean plants irrigated with saline water.MLE was the most effective in boosting up germination percentage and succeeding seedling growth under salinity levels.

References

Abou El-Nour, E.Z., Rezk, A.I. and El-Fouly, M.M. (2005) Plant nutrition under salinity condition (A Review). Egypt J. Agric. Res., 2 (1): 349-363.

Ashraf, M. and Iram, A. (2002) Optimization and influence of seed priming with salts of potassium or calcium in two spring wheat cultivars differing in salt tolerance at the initial growth stages. Agro. Chimica. 46: 47-55.

Ayyub, C.M., Manan, A., Pervez,M.A., Ashraf, M.I, Afzal, M., Ahmed, S., Shoab, E. M., Jahangir M., Anwar N., and Shaheen, M. (2013) Foliar feeding with gibberellic acid (GA3): A strategy for enhanced growth and yield of Okra (*Abelmoschus esculentus L.* Moench.) Afr. J. of Agric. Res. Vol. 8(25): 3299-3302.

Bradford, K.J. (1986) Manipulation of seed water relations via osmotic priming to improve germination under stress conditions. Hort. Sci. 21: 1105- 1112.

Cetinbas, M. and Koyuncu, F. (2006). Improving germination of Prunus avium L. seeds by gibberellic acid, potassium nitrate and thiourea. Hort. Sci. (Prague) 33:119–123.

Cottenie, A., Verloo, M. Velghe, G. and Comerlynk, R. (1982) Chemical analysis of plant and soil. Laboratory of analytical and agro-chemistry state university, Ghent, Belgium.

Dhupper,R. (2013) Effect of gibberellic acid on seed germination and seedling growth behavior in three desert tree species. J. Biol. Chem. Research. Vol. 30, No. 1: 227-232.

Eid, R.A. and Abou-Leila, B.H. (2006) Response of croton plants to gibberellic acid, benzyl adenine and ascorbic acid application. World J. Agric. Sci., 2: 174–176.

El-Fouly, M. M. Mobarak, Z. M. and Salama, Z. A. (2002) Micronutrient foliar application increases salt tolerance of tomato seedlings. Proc. Symp. Techniques to Control Salination for Horticultural Productivity. Akosy U. et al., Eds. Acta Hort. 573:377-385.

El-Fouly,M.M., Abou El-Nour, E. A. and Abdel-Maguid, A. A. (2004) Counteracting effect of foliar application of macronutrients on spinach beet (*Beta vulgaris var. cycla*) grown under NaCl-salinity stress. Agric. Cairo Univ.55:587-602.

El-Naggar,A.,El -Naggar, H.A. and Ismaiel ,N.M.(2009) Effect of phosphorus application and gibberellic acid on the growth and flower quality of (*Dianthus caryophyllus L.*). American-Eurasian J. Agric. and Environ. Sci., 6: 400-410.

Fahey, J. (2005) Moringa oleifera: A Review of the medical evidence for its nutritional therapeutic and prophylactic properties. Part 1. Trees for Life Journal. (Accessed on July 23, 2011). Online available at: http://www.tfljournal.org/article .php/20051201124931586.

Fowler, J.L. (1991) Interaction of salinity and temperature on the germination of crambe.Agron. J. 83:169-172.

Fuglie, L.J. (2000) New uses of moringa studied in Nicaragua. p. 68. *In* ECHO Development Notes biomasa@ibw.com.

Grattan, S. R. and Grieve, C. M. (1994) Mieral nutrient acquisition response by plants grown in saline environments, pp. 203-226. In:
Pessarakli, M. (Eds.). Handbook of Plant and Crop Stress. Marcel Dekker. New York.

Grattan, S.R. and Grieve,C.M. (1999) Salinity - Mineral nutrient relations in horticultural crops. Sci. Hort. 78:127-157.

Hassanein, S.A., Kandil, N.F.Abu-Sinna, M.A. and Selem, M.I. (1993) Effect of irrigation with Bahr El-Baqar drain water on some soil chemical properties and yield. Commu. In. Sci. and Dev. Res. 41:311-319.

Imran ,S., Afzal ,I. Amjad,M. Akram ,A. , Khawar ,K and Pretorius ,S. (2014) Seed priming with aqueous plant extracts improved seed germination and seedling growth under chilling stress in Lentil (*Lens culinaris* Medik) Acta Advances in Agricultural Sciences V, 02 Issue 11, 58-69 .

Ismail, A.M. and Azooz, M.M. (2002) Response of Vicia faba to salinity and vitamins. Indian J. Plant Physiol., 7: 303–306.

Klute,A. (1986) Methods of Soil Analysis. Part 1. Physical and mineralogical Methods 2nd Ed., Amer. Soc. Agron. Monograph No. 9 Madison,Wisconsin,USA.

Makkar, H.P. and Becker, K. (1996) Nutritional value and anti nutritional components of whole and ethanol extracted Moringa oleifera leaves. Animal Feed Science and Technology 63: 211-228.

Mer, R. K., Pajith, P. K. Pandya, D. M. Pandey, A. N. (2000) Effect of salts on germination of seeds and growth of young plants of *Hordeum valgare*, *Triticum aestivum*, and *Brassica juncea*. J. Agro. Crop Sci. 185(4):209-217.

Munns, R. and Tester, M. (2008) Mechanisms of salinity tolerance. Annu. Rev. Plant Biol.59:651- 681.

Mvumi , C., Tagwira, F. and Chiteka, A. (2013) Effect of moringa extract on growth and yield of maize and common beans. Greener Journal of Agricultural Sciences. 3 (1): 055-062.

Noman, I. (2008) Efficacy of moringa leaf extract as seed priming agent in hybrid maize. M.Sc. (Hons.) Thesis, department of Crop Physiology, University of Agriculture, Faisalabad.

Nouman, W., Siddiqui, M.T. and. Basra, S.M. (2011). Moringa oleifera leaf extract: An innovative priming tool for rangeland grasses. Turk. J. 35. V: 10.3906, 1009- 1261. (In press).

Ould Ahmed, B.A., Yamamoto T., Inoue, M. (2007) Response of drip irrigated sorghum varieties growing in dune sand to salinity levels in irrigation water. J. Appl. Sci. 7: 1061-1066.

Page, A. L., Miller, R.H. and Keeny, D.R. (1982) Methods of Soil Analysis. Part П. Chemical and microbiological properties 2nd Ed., Amer. Soc. Agron. Monograph No. 9 Madison,Wisconsin,USA.

Ragab, M.A , Hellal,F.A, . Abd El-Hady,M. (2008) Water salinity effect on some soil water constants and plant .Twelfth International Water Technology Conference, IWTC12 2008 Alexandria, Egypt 1 irrigation.

Shohani,F. and Mehrabi,A.(2014) The effect of gibberellic acid (GA_3) on seed germination and early growth of Lentil seedlings under salinity stress. Middle-East Journal of Scientific Research 19 (7): 995-1000.

Srinivasan, V., Kandiannan, K. and Hamza, S. (2013) Efficiency of sulphate of potash (SOP) as an alternate source of potassium for black pepper (*Pipernigrum* L.). J. Spices Arom. Crops, 22(2): 120-126.

Tester, M. and Davenport, R. (2003) Na tolerance and Na transport in higher plants. Annals of Botany. 91:503-527.

تحفيز نمو وانبات الفول تحت مستويات ملوحة

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ملخص

أجريت تجربة اصص فى مزرعة كلية الزراعة – جامعة الازهر – مدينة نصر بالقاهرة بهدف دراسة تاثير اضافة حمض الجبريلك بتركيز ٣٠٠ ملليجرام / لتر ومستخلص اوراق المورنجا بنسبة ١:٣٠ على نمو وانبات الفول تحت مستويات ملوحة فى ارض رمليه. تم الرى بمياه من بحيرة قارون تم تخفيفها حتى وصلت الى التركيزات المطلوبة (٥٠٠ – ١٠٠٠- ١٥٠٠ ملليجرام/لتر) بالاضافة الى الرى بماء صنبور ككنترول .

وقد اوضحت النتائج ما يلى:

- زيادة نسبة الانبات نتيجة لنقع البذور بمستخلصات اوراق المورنجا والجبريلك لمدة ٢٤ ساعه ،حيث اظهرمستخلص اوراق المورنجا افضل نسبة انبات مع الرى بماء مالح بتركيز ١٠٠٠ ملليجرام / لتر وذلك بعد ٥ ايام من الزراعة .

- زيادة تركيز الاملاح الذائبة ورقم الحموضة للتربة نتيجة الرى بماء مالح ، مما ادى الى نقص فى الوزن الرطب والجاف لنبات الفول بعد ٦٠ يوم من الزراعة. وكذا لوحظ نقص فى محتوى النبات من العناصر الغذائية الكبرى نتيجة للرى بتركيزات عالية من الاملاح.

- ادى اضافة مستخلصات اوراق المورنجا والجبريلك (كمواد رش على النبات) الى زيادة فى الوزن الرطب والجاف لنبات الفول ،وكذا زيادة محتواه من العناصر الغذائية الكبرى تحت مستويات الملوحة المختلفة المدروسة مقارنة بالكنترول. حيث اظهرت اضافة هذه المواد بالمعدلات المدروسة افضل النتائج وخاصة مستخلص اوراق المورنجا.