International Journal of Botany Studies
ISSN: 2455-541X; Impact Factor: RJIF 5.12
Received: 14-02-2019; Accepted: 17-02-2019
www.botanyjournals.com
Volume 4; Issue 3; May 2019; Page No. 77-81

Effect of nano-fertilizers, salicylic acid, and organic matter in growth and yield of rocket (*Eruca sativa* Mill) under Salt stress

Duraid KA AL-Taey[1], Zahraa JM Almusawi[2]
[1, 2] Agriculture College, Al-Qasim Green Univ., Hilla, Iraq

Abstract
The field experiment was conducted to study the effect of irrigation water quality and the interactions on the content of the active materials for Rocket plant (*Eruca sativa* Mill) in Karbala province, Touirij district, Al-Hindiya horticulture station, Ministry of Agriculture during the autumn season of 2017 where the experiment included 54 experimental units with two factors: The first factor is the quality of irrigation water (WQ, fresh water, drainage water). The second factor was the following combinations: The control treatment T1, Traditional compound fertilizer (0.6 $g.m^{-2}$) T2, nano-compound fertilizer (1 $g.L^{-1}m^{-2}$) T3, Poultry Wastes (300 $g.m^{-2}$) T4, Salicylic acid (10 $ml.L^{-1}.m^{-2}$) T5, Poultry Wastes + Salicylic acid T6, nano-compound fertilizer + Salicylic acid T7, nano-compound fertilizer + Poultry Wastes T8, nano-compound fertilizer + Poultry Wastes + Salicylic acid T9), where the experiment was applied according to split-plot design, with three replicates. The results showed that the increase in salinity of irrigation water led to lower the traits of vegetative growth (chlorophyll, the fresh yield for the first cutting, the dry yield for the first cutting, the fresh yield for the second cutting, the dry yield for the second cutting, leaf area and NPK in leaves) and increasing the leaves content of Na. The T3 treatment achieved an increase in the traits of vegetative growth (the fresh yield for the second cutting, the dry yield for the second cutting, leaf area) while the T3 treatment led to increase the leaves content of chlorophyll. The T9 treatment led to an increase of (the fresh yield for the first cutting, the dry yield for the first cutting and NPK in leaves) compared to the control treatment.

Keywords: salinity, salicylic acid, organic matter, poultry compost, salt stress

1. Introduction

Rocket (*Eruca sativa* Mill) is a plant that has acquired the medicine and food importance, it is a herbaceous winter plant belonging to the Brassicaceae family. It is cultivated in temperate regions throughout the year except for the very hot and cold months (Rafid and Mohammed, 2009) [13]. Waters of wells and drainage are also one of the important natural resources for irrigation in a large number of countries in the world especially in the dry and semi-dry regions, where it is relied upon as one of the alternative sources of water scarcity, especially in the summer months. There are several methods to use salt drainage water for irrigation, including salt water mixing with fresh water, alternation of salt water with fresh water, using of organic waste to improve the physical and chemical traits of soil (Al-Taey *et al*, 2019) [2], using salt water at a certain stage of plants growth resistant to saline and using Growth regulators (Al-Taey, 2017) [4]. Nanomaterials are currently being used as nanotechnology provides new multidisciplinary windows in agricultural and food sciences and contributes to many agricultural research that can lead to new ways to solve many agricultural problems. where nanoparticles have other potential applications in the farming system Such as the detection of pollutants, plant diseases, pests, and pathogens, especially in foliar fertilization or soil fertilization (Ghormade *et al*., 2011) [6]. Organic fertilization can be characterized by slow fertilizer behavior in balancing the processing of different soil elements and the balance between vegetative and fruit growth in the plant. The effect of positive organic fertilizer on the processing of nutrients can continue after the end of plant growth for subsequent seasons (Mohammad, 2013; Burhan and Al-Taey, 2018) [5]. In the plant, Salicylic acid and its chemical composition (Orthro_ Hydroxy Benzoic Acid) are considered plant hormones that produce and play an important role in regulating most plant bio-activities such as plant growth, photosynthesis and flower arrangement. In the last two decades, the acid has been of interest to scientists and researchers because it is related to the defense systems inside the plant against stress, especially under saline conditions, by reducing the production of oxidizing systems and reducing the damage caused by these free oxygen radicals (Al-Taey *et al*., 2010) [3]. The study aims to use several combinations of organic fertilizer mixtures with nanoparticles and salicylic acid to show their effect in the natural state and when the plant is exposed to salt stress caused by irrigation with saline water.

2. Materials and Methods

A field experiment for the agricultural season 2017-2018 was conducted in Karbala province, Touirij district, Al-Hindiya horticulture station on 15/10/2017. The area of the field was plowed, smoothed and divided into three sectors and the distance between the sector and another is 1 m. Each sector included 18 experimental units (1 m x 1 m) and the distance between the plot and another is 20 cm. A square basin, its area is (3 x 3 m^2) with a depth of (1.25 m), was then constructed to collect the water for the purpose of irrigation according to the temporal discharge of water and for each plot, The study included two factors: The first factor is the quality of irrigation water, which includes drainage water WQ2 and freshwater WQ1, irrigated at an average of eight irrigations during the season, between irrigation and another is a week to two weeks according to plant needs. The second factor includes combinations (interacted T) including Traditional compound fertilizer NPK (0.6 g.m^{-2}), nano-compound fertilizer NPK0 (1 g.L^{-1}m^{-2}) (Al-Zobaie, 2000), Poultry Wastes (300 g.m^{-2}), Salicylic acid (10 ml.L^{-1}.m^{-2}) and both according to the fertilizers recommendations. The experiment was conducted as a factorial experiment in the split-plot design which included 3 replicates, each replicate containing 18 units. Soil analysis was conducted prior to planting in the laboratory of analysis belonging to postgraduate studies at the College of Agriculture, Al-Qasim green University (Soil Department) by taking ten random samples from field soil and at a depth of 30 cm. It was then spread out into the air for a week, then milled and sieved it.

3. Results and discussion

The vegetative yield of the unit area for the first cutting (kg.ha^{-1})

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 ds.m^{-1}) achieved the highest average amounted to (10700.8 kg.ha^{-1}) compared to the treatments irrigated with saline water (8 ds.m^{-1}) which gave the lowest average amounted to (8412.8 kg.ha^{-1}). While the results of the combinations T9 achieved the highest average amounted to (13904 kg.ha^{-1}) compared to the control treatment T1 which gave (5632 kg.ha^{-1}) and without significant differences with each of T2 treatment (12284.8 kg.ha^{-1}) and T6 treatment (10612.8 kg.ha^{-1}). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 ds.m^{-1}) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 ds.m^{-1}), where the highest average achieved for the freshwater WQ1 at the treatment T9 (15382.4 kg.ha^{-1}). The lowest average achieved at the control treatment T1 (6195.2 kg.ha^{-1}) but with no significant differences with each of the treatment T2 (13675.2 kg.ha^{-1}), T4 treatment (11686.4 kg.ha^{-1}), T6 treatment (11475.2 kg.ha^{-1}) and T3 treatment (11352 kg.ha^{-1}), As for the drainage water WQ2, the highest average was achieved at the treatment T9 (12425.6 kg.ha^{-1}) compared to the control treatment T1 (5086.4 kg.ha^{-1}) without significant differences with each of the T2 (10894.4 kg.ha^{-1}), T6 (9750.4 kg.ha^{-1}) and T8 (8395.2 kg.ha^{-1}).

The dry yield of the unit area for the first cutting (kg.ha^{-1})

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 ds.m^{-1}) achieved the highest average amounted to (1531 kg.ha^{-1}) compared to the treatments irrigated with saline water (8 ds.m^{-1}) which gave the lowest average amounted to (1211 kg.ha^{-1}). While the results of the combinations T9 achieved the highest average amounted to (2103 kg.ha^{-1}) compared to the control treatment T1 which gave (978 kg.ha^{-1}) and without significant differences with each of T2 treatment (1956 kg.ha^{-1}). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 ds.m^{-1}) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 ds.m^{-1}), where the highest average achieved for the freshwater WQ1 at the treatment T9 (2237 kg.ha^{-1}). The lowest average achieved at the control treatment T1 (1018 kg.ha^{-1}) but with no significant differences with the treatment T2 (2068 kg.ha^{-1}), As for the drainage water WQ2, the highest average was achieved at the treatment T9 (1968 kg.ha^{-1}) compared to the control treatment T1 (938 kg.ha^{-1}) without significant differences with the T2 (1844 kg.ha^{-1}).

The leaves content of total chlorophyll (mg.100 g^{-1} fresh weight)

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 ds.m^{-1}) achieved the highest average amounted to (109.96 mg.100 g^{-1} fresh weight) compared to the treatments irrigated with saline water (8 ds.m^{-1}) which gave the lowest average amounted to (100.64 mg.100 g^{-1} fresh weight). While the results of the combinations T3 achieved the highest average amounted to (117.69 mg.100 g^{-1} fresh weight) compared to the control treatment T1 which gave (93.07 mg.100 g^{-1} fresh weight). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 ds.m^{-1}) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 ds.m^{-1}), where the highest average achieved for the freshwater WQ1 at the treatment T3 (129.75 mg.100 g^{-1} fresh weight). The lowest average achieved at the control treatment T1 (102.43 mg.100 g^{-1} fresh weight), As for the drainage water WQ2, the highest average was achieved at the treatment T9 (109.67 mg.100 g^{-1} fresh weight) compared to the control treatment T1 (83.7 mg.100 g^{-1} fresh weight) without significant differences with the T2 (108.87 mg.100 g^{-1} fresh weight).

Leaf area (cm^2.plant^{-1})

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 ds.m^{-1}) achieved the highest average amounted to (3.29 cm^2.plant^{-1}) compared to the treatments irrigated with saline water (8 ds.m^{-1}) which gave the lowest average amounted to (2.33 cm^2.plant^{-1}). While the results of the combinations T2 achieved the highest average amounted to (4.94 cm^2.plant^{-1}) compared to the control treatment T1 which gave (1.77 cm^2.plant^{-1}). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 ds.m^{-1}) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 ds.m^{-1}), where the highest average achieved for the freshwater WQ1 at the treatment T2 (6.09 cm^2.plant^{-1}). The lowest average achieved at the control treatment T1 (1.9 cm^2.plant^{-1}), As for the drainage water WQ2, the highest average was achieved at the treatment T2 (3.8 cm^2.plant^{-1}) compared to the control treatment T1 (1.64 cm^2.plant^{-1}).

The percentage of nitrogen (mg.g^{-1} dry weight)

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 ds.m^{-1}) achieved the highest average amounted to (4.31 %) compared to the treatments irrigated with saline water (8 ds.m^{-1}) which gave the lowest average amounted to (3.5 %). While the results of the combinations T9 achieved the highest average amounted to (4.53 %) compared to the control treatment T1 which gave (2.81%) and without significant differences with each of T3 treatment (4.44%), T5 treatment (4.13%), T7 treatment (4.03%), T8 treatment (4.08%). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 $ds.m^{-1}$) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 $ds.m^{-1}$), where the highest average achieved for the freshwater WQ1 at the treatment T9 (5.03 %) compared to the lowest average achieved at the control treatment T1 (3.07 %) but with no significant differences with each of the treatment T3 treatment (4.95%), T4 treatment (4.49%), T5 treatment (4.23%), T7 treatment (4.75%), T8 treatment (4.32%)., As for the drainage water WQ2, the highest average was achieved at the treatment T5 (4.03 %) compared to the control treatment T1 (2.56 %) without significant differences with each of the T9 (4.04)%, T3 (3.92)%, T8 (3.83)%, T2 (3.54)%, T7 (3.32%) and T4 (3.29)%.

The percentage of phosphorus ($mg.g^{-1}$ dry weight)

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 $ds.m^{-1}$) achieved the highest average amounted to (1.22 %) compared to the treatments irrigated with saline water (8 $ds.m^{-1}$) which gave the lowest average amounted to (0.76 %). While the results of the combinations T9 achieved the highest average amounted to (1.31 %) compared to the control treatment T1 which gave (0.5 %) and without significant differences with each of T3 treatment (1.08%), T4 (1.03%), T5 treatment (1.01%), T7 treatment (1.25%), T8 treatment (1.07%). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 $ds.m^{-1}$) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 $ds.m^{-1}$), where the highest average achieved for the freshwater WQ1 at the treatment T9 (1.61 %) compared to the lowest average achieved at the control treatment T1 (0.75 %) but with no significant differences with each of the T2 treatment (1.13%), T3 treatment (1.27%), T4 treatment (1.277%), T6 treatment (1.17%), T7 treatment (1.44%), T8 treatment (1.3%), As for the drainage water WQ2, the highest average was achieved at the treatment T7 (1.06 %) compared to the control treatment T1 (0.25 %) without significant differences with each of the T9 (1.02)%, T3 (0.89)%, T8 (0.84)%, T6 (0.63)%, T4 (0.8%) and T5 (0.96)%.

The percentage of potassium ($mg.g^{-1}$ dry weight)

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 $ds.m^{-1}$) achieved the highest average amounted to (6.15 %) compared to the treatments irrigated with saline water (8 $ds.m^{-1}$) which gave the lowest average amounted to (5.40 %). While the results of the combinations T8 achieved the highest average amounted to (6.07 %) compared to the control treatment T1 which gave (4.94 %) and without significant differences with each of T3 treatment (5.87%), T4 (5.93%), T5 treatment (5.8%), T6 treatment (6.01), T7 treatment (5.89%), T9 treatment (5.97%). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 $ds.m^{-1}$) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 $ds.m^{-1}$), where the highest average achieved for the freshwater WQ1 at the treatment T6 (6.43 %) compared to the lowest average achieved at the control treatment T1 (5.52 %) but with no significant differences with each of the T2 treatment (5.96%), T3 treatment (6.16%), T4 treatment (6.32%), T5 treatment (6.11%), T7 treatment (6.21%), T8 treatment (6.38%), T9 treatment (6.33%), As for the drainage water WQ2, the highest average was achieved at the treatment T5 (5.5 %) compared to the control treatment T1 (4.36 %) without significant differences with each of the T9 (5.61)%, T3 (5.59)%, T7 (5.65%), T8 (5.77)%, T6 (5.58)%, T4 (5.46%) and T2 (5.1%).

The percentage of sodium ($mg.g^{-1}$ dry weight)

Table (1) shows that there are significant differences when irrigation with different quality of the water where the treatment irrigated with Freshwater (1.2 $ds.m^{-1}$) achieved the highest average amounted to (2.63 %) compared to the treatments irrigated with saline water (8 $ds.m^{-1}$) which gave the lowest average amounted to (1.61 %). While the results of the combinations T2 achieved the highest average amounted to (2.64 %) compared to the control treatment T1 which gave (1.28 %) and without significant differences with each of T3 treatment (2.35%), T4 (2.37%), T5 treatment (5.8%), T6 treatment (2.17), T8 treatment (2.33%), T9 treatment (2.11%). Table (2) shows the bi-interactions between the quality of irrigation water and combinations. All combinations that irrigated with fresh water WQ1 (1.2 $ds.m^{-1}$) was significantly excelled on the combinations that irrigated with drainage water WQ2 (8 $ds.m^{-1}$), where the highest average achieved for the freshwater WQ1 at the treatment T2 (3.54 %) compared to the lowest average achieved at the control treatment T1 (1.76 %) but with no significant differences with each of the T3 treatment (3.18%) and T4 treatment (2.85%), As for the drainage water WQ2, the highest average was achieved at the treatment T9 (2 %) compared to the control treatment T1 (0.8 %) without significant differences with each of the T8 (1.94), T4 (1.89)%, T2 (1.75)%, T6 (1.71), T3 (1.52)%, T7 (1.51)% and T5 (1.35)%.

Table 1: Effect of irrigation water quality, combinations, and interactions between them in some vegetative and quality traits.

Treatment	Vegetative yield	Dry yield	Chlorophyll	Leaf area	N%	P%	K%	Na%
WQ1	10700.8	1531	109.96	3.29	4.31	1.22	6.15	1.61
WQ2	8418.8	1211	100.64	2.33	3.5	0.76	5.40	2.63
LSD	1457.28	224.2	2.091	0.62	0.624	0.229	0.630	0.135
T1	5632	978	93.07	1.77	2.81	0.5	4.94	1.28
T2	12284.8	1956	109.77	4.94	3.90	0.79	5.53	2.64
T3	9310.4	1230	117.69	2.88	4.44	1.08	5.87	2.35
T4	9979.2	1151	99.65	2.68	3.89	1.03	5.89	2.37
T5	6969.6	1014	100.25	2.35	4.13	1.01	5.8	1.82
T6	10612.8	1466	110.73	2.38	3.31	0.9	6.01	2.17
T7	8219.2	1164	103.15	2.54	4.03	1.25	5.93	1.99
T8	9152	1276	101.45	2.52	4.08	1.07	6.07	2.33
T9	13904	2103	111.95	3.24	4.53	1.31	5.97	2.11
LSD	3491.84	193	1.931	0.445	0.627	0.354	0.519	0.543

Table 2: Bi-interaction for the effect of irrigation water quality and combinations in vegetative and quality traits.

Treatment	Vegetative yield	Dry yield	Chlorophyll	Leaf area	N%	P%	K%	Na%
WQ1 T1	6195.2	1018	102.43	1.90	3.07	0.75	5.52	0.8
WQ1 T2	13675.2	2068	110.67	6.09	4.26	1.13	5.96	1.75
WQ1 T3	11352	1491	129.75	3.29	4.95	1.27	6.16	1.52
WQ1 T4	11686.4	1392	103.73	2.69	4.49	1.277	6.32	1.89
WQ1 T5	7884.8	1236	100.53	2.59	4.23	1.06	6.11	1.35
WQ1 T6	11475.2	1573	118.54	2.63	3.66	1.17	6.43	1.71
WQ1 T7	8782.4	1345	105.43	3.21	4.75	1.44	6.21	1.51
WQ1 T8	9891.2	1417	104.3	3.15	4.32	1.3	6.38	1.94
WQ1 T9	15382.4	2237	114.23	4.04	5.03	1.61	6.33	2
WQ2 T1	5086.4	938	83.7	1.64	2.56	0.25	4.36	1.76
WQ2 T2	10894.4	1844	108.87	3.80	3.54	0.45	5.1	3.54
WQ2 T3	7251.2	970	105.63	2.47	3.92	0.89	5.59	3.18
WQ2 T4	8272	910	95.57	2.67	3.29	0.797	5.46	2.85
WQ2 T5	6054.4	791	99.97	2.11	4.03	0.96	5.5	2.28
WQ2 T6	9750.4	1359	102.93	2.13	2.97	0.63	5.58	2.63
WQ2 T7	7656	983	100.87	1.87	3.32	1.06	5.65	2.46
WQ2 T8	8395.2	1135	98.6	1.89	3.83	0.84	5.77	2.72
WQ2 T9	12425.6	1968	109.67	2.43	4.04	1.02	5.61	2.22
LSD	4699.2	279.2	2.761	0.681	0.887	0.483	0.757	0.72

The results showed that there was a significant decrease in the indices of vegetative growth (fresh yield of the first cutting, dry yield for the first cutting, chlorophyll, leaf area) using salt water compared to fresh water. This is due to the Osmotic effect caused by the increase of salts in the soil, this leads to the absorption of water by the plant, which in turn leads to the entry of nutrient elements, which negatively affects cellular metabolism and the bio-activities within the cell affecting major activities such as photosynthesis and respiration (Golezani *et al*., 2011) [7], As for the decrease in leaf area due to the increase in salinity of irrigation water may be due to the Osmotic effect due to the low quantity of water entering the plant, as well as the lack of transferring nutrient elements and growth hormones from the roots to the rest of the plant parts or to the lack of Turgor Pressure for the leaf cells, Which leads to a lack of elongation, therefore decrease of leaf area (AL-Taey and Saadoon, 2012) [4], As for the decrease in the percentage of nitrogen in the leaves may be due to the negative effect for salinity on nitrogen absorption, The negative effect of salinity is directly summarized by the competition between Cl^- and No^{-3} and the nitrate absorption or indirectly by altering the permeability properties of the plasma membranes by influencing membrane proteins (Meloni *et al*., 2004; Al-Taey, 2017) [12, 4]. The reason for the significant decline in the percentage of phosphorus is due to the competitive effect between Cl^- and H_2PO_4. Chloride reduces the absorption of H_2PO_4 by the plant (Pessarakli, 1999) [14]. Both Martinez and Lauchli (1994) [11] indicated that the decrease in the percentage of phosphorus in the leaves is not only due to the competitive effect of NaCl but also to reducing its transfer from the root to the vegetative, causing a decrease in the percentage of phosphorus in the leaves. The reason for the decrease in the amount of potassium absorbed by the plant with increasing soil salinity is due to increasing concentration of sodium in the soil solution and the competitive effect of potassium ions and other positive ions that are contained in the irrigation water used in the experiment such as sodium, calcium and magnesium and their competition on the locations of absorption in plant roots. These results agree with (Wenjn *et al*., 2008; Al-Zaidi, 2011; Al-Taey (2013) [15, 28], who indicated to a decrease in plant content of potassium with increasing salinity of irrigation water, where Increasing sodium concentrations lead to nutrient imbalance and lack of absorption it by the plant (Khan, 2010) [9].

4. References

1. Al-Juthery HWA, Ali NS, Al-Taey DKA, Ali EAHM. The impact of foliar application of nanaofertilizer, seaweed and hypertonic on yield of potato. Plant Archives. 2018; 18(2):2207-2212.
2. Al-Taey DKA, Al-Janabi AH, Rachid AM. Role of additive in mitigation of the negative effects of saline

water on cabbage (*brassica oleracea var. capitata* L.). Plant Archives. 2019; 19(1):78-85.
3. Al-Taey DKA, AlAzawi SSM, Husien MH. Effect of Spraying Acetyl Salicylic Acid on the Plant Tolerance for Salt Stress & Survival Percentage after Transplanting of Orange (Citrus sinensis). Babylon Journal University -Pure and Applied science. 2010; 18(4):1513-1520.
4. Al-Taey DKA. Mitigation of Salt Stress by Organic Matter and GA3 on Growth and Al-Taey, D.K.A. and A.H. saadoon.2012. Effect of treatment of kinetin to reduce the salinity damage by drainage water irrigation on the growth, and nitrate accumulation in the leaves of spinach, Spenacia oleracea L.Euphrates Journal of Agriculture Science. 2017; 4(4):11-24.
5. Burhan AK, AL-Taey DKA. Effect of Potassium humate, humic acid, and compost of rice wastes in the growth and yield of two cultivars of Dill under salt stress conditions. Advances In Natural And Applied Sciences. 2018; 12(11):1-6.
6. Ghormade V, Deshpande MV, Paknikar KM. perspectives for nano-biotechnology enabled protection and nutrition of plants. Biotechnoladv. 2011; 29:792-803.
7. Golezani KG, Salmasi SZ, Dastborhan S. Changes in essential oil content of dill (Anethumgraveolens) organs under salinity stress. Journal of Medicinal Plants Research. 2011; 5:14.
8. Goodwin TW. Chemistry & Biochemistray of Plant Pigment. 2nd Academic.Prss. London. New York. San Francisco, 1976, 373.
9. Khan A, Syeed S, Masood A, Nasar R, Iqpal N. Application of salicylic acid increases contents of nutrients and antioxidative metabolism in mung bean and alleviates adverse effects of salinity stress. International journal of plant biology. 2010; 1:1-8.
10. Kusumi K, Yaeno T, Kojo K, Hirayama M, Hirokawa D, Yara A, Iba K. The role of salicylic acid in the glutathione-mediated protection against photooxidative stress in rice. Physiol Plant. 2006; 128:651-661.
11. Martinez V, Lauchli A. Salt-induced inhibition of phosphate uptake in plants of cotton (*Gossypium hirsutum* L.). new phytol. 1994; 125:609-614.
12. Meloni DA, Gulotta MR, Martinez CA, Oliva MA. The effects of salt on growth, nitrate reduction and proline and glycinebetaine accumulation in Prosopis alba. Braz. J. Plant Physiol. 2004; 16(1):39-46.
13. Mohammed HC, Rafiq A. Investigating the possibility of using least desirable adible oil of *Eruca sativa* Mill. In bio diesel production, Pakistan J. Bot. 2009; 41(1):481-487.
14. Peroxidase Activity in Pepper (*Capsicum annum* L.). Advances in Natural and Applied Sciences, Pessarakli, M. Hand Book of the plant of crop stress. Second edition, University of Arizona. The U.S.A, 1999.
15. Wenjn MAZ, Jiuag MZ, Vong Driessen PM. Effect of saline water irrigation on soil salinity and yield of winter wheat-maize in north China plant. Irrig. Drainage, system. 2008; l22:3-18.