Effect of Salinity Irrigation Water on the Mineral Leaves Content for a Number of Alqutha Cucumber (\textit{Cucumis Melo Var. Flexuosus}) Cultivated in Greenhouses

A. A. Abdulla, A. M. Abd and H. A. K. Al Khazraji*

Department of Horticulture and Land Scape, College of Agriculture, University of Basrah - Iraq

*Corresponding author email: hay9561@gmail.com

Abstract. The experiment was conducted in the winter agricultural season 2020 in the greenhouses of Al-Faris Company in Al-Zubair district. The aim of the study is studying the effect of salinity of irrigation water on the mineral leaves content of twenty-one cultivars of Armenian Cucumber (\textit{Cucumis melo var. flexuosus}). Where the experiment included 42 treatments, which resulted from two main factors, the first one is irrigation water, which are (1 and 5 dS.m\(^{-1}\)) and the second factor was included 21 cultivars, of Armenian cucumber were selected, 16 of which are local and 5 imported. The study showed that the salinity of irrigation water caused a significant increase in the leaves content of potassium and sodium, with an increase of 33.71% and 324.43%, respectively, while irrigation with Natural water caused an increase in the percentage of the potassium element to the sodium with an increase reached 330.83%. While the cultivars differed in their content of mineral elements, where the Tikrit cultivar excelled with the highest content of phosphorous and potassium amounted to 0.2299% and 6.820%, respectively. While the Diyala cultivar gave the highest leaves content of sodium 5.548% and the Karbala cultivar excelled and gave the highest percentage of potassium to sodium in the leaves of 5.681%, while the Italian cultivar recorded the lowest percentage of phosphorus in the leaves 0.0201, the Diwaniyah cultivar gave the lowest percentage of potassium in leaves, reaching 4.240%, and the cultivar Amarah gave the lowest percentage of sodium in the leaves, reaching 2.218%. Where the Mosul cultivar (Abu Akaf) gave the lowest average of potassium to sodium ratio in the leaves when it reached 1.209%.

1. Introduction

Armenian Cucumber (\textit{Cucumis melo Var. flexuosus}) is one of the important summer crops of the Cucurbitaceae family, and it is believed that the Mediterranean basin is its original home. It is grown in order to obtain its fruits that are eaten natural for the purpose of pickling or salads of good nutritional value to contain a group of vitamins, namely (A, B, C) In addition to some nutrients, including Mn, S, Fe, P, Ca, which have an alkaline taste, cooled, cleansing blood, dissolving urinary acids and diuretic salts, and are used to treat freckles and melasma. It is cultivated in Iraq in open fields with two spring and autumn crops, and it can also be cultivated under saline conditions [14]. Although the productivity of the Armenian cucumber is relatively low in the country, and it can achieve an increase in the productivity level by studying the environmental conditions that affect growth and production, including salinity. Salinity is one of the most important abiotic environmental stress that negatively affect the growth and metabolism of plants due to its direct negative effects (toxicity and osmosis) on plants as well as the imbalance of nutrients and indirect effects on the chemical and physical properties of the soil [2]. As the accumulation of salts in agricultural lands reduces the percentage of germination, plant growth and its inability to complete its life cycle, due to the negative role of the salts affecting various physiological processes in plants [3]. [4] showed that the Watermelon cultivar was significantly excelled on the...
Ideal cultivar when cultivated during the spring season in Mosul province in the percentage of phosphorus in the leaves, but the Ideal cultivar was excelled in the percentage of nitrogen in the leaves and they did not differ in the percentage of potassium in the leaves. [5] showed in their experiment the effect of salinity on the growth of seedlings of 43 cultivars melon plants and the concentration of salinity 50 and 100 mmol NACL, noting that the salinity did not affect the percentage of phosphorus and the percentage of potassium to sodium.

[11] obtained in their study the effect of soil salinity which are 3.35 and 3.35 dS.m⁻¹ caused a significant decrease in the nitrogen, phosphorous and potassium content of leaves, while it caused a significant increase in the leaf sodium content when the soil salinity increased. [1] studied the effect of three levels of salinity 0.5, 1 and 2.5 dS.m⁻¹ in the growth of the melon plant, which caused a higher concentration of 2.5 dS.m⁻¹ a significant increase in the potassium content of the plant compared to the concentration of 0.5 dS.m⁻¹. Therefore, the study aimed to know the effect of irrigation water salinity on the mineral content of Armenian cucumber leaves.

2. Materials and Methods
The experiment was conducted in the winter agricultural season 2020 in one of the farms of Al-Faris Agricultural Company in the desert area of Safwan district in Basra province, the aim of the experiment is studying the effect of salinity irrigation water on the mineral content of twenty-one cultivars of Armenian cucumber leaves. As the experiment included combinations of 42 factorial treatments that resulted from two types of salinity of irrigation water, which are (1 and 5 dS.m⁻¹) and 21 cultivars of Armenian cucumber, of which 16 are local cultivars belonging to the following province, Basra, Amarah, Nasiriyah, Kut, Hilla, Diwaniyah Karbala, Najaf, Samawah, Baghdad, Diyala, Tikrit, Kirkuk (Abu Zughab cultivar), Mosul (Abu Akaf and Dory cultivar), Ramadi, and 5 imported cultivars are the Iranian cultivar Ghanami and the Tarouz hybrid produced by the company French Flemorin and Taarzi hybrid produced by the Dutch company Simins, and from Egyptian by the International Andalusian Company, and Italian by Pagano Costantino. The land was prepared by Tillage it with a triple-Mold board plow orthogonally, smoothing, leveling it and dividing it into 6 lines of 42 m long and the distance between them was 1.28 m, fertilized with decomposing animal manure (which is cow waste) and chemical fertilizer Blaukorn chassic, The land was sterilized with a sterilization pesticide, and then the lines were buried in the field soil, 15 cm above the soil surface, so that the line width reached 40 cm. The drip irrigation system was placed in the middle of the line, then the lines were covered with a black plastic cover to maintain soil moisture and prevent the growth of the bushes and warm the soil, The seeds were cultivated on 1/16 on both sides of the line, corresponding to the distance between pit and another 40 cm. One line was divided into 21 experimental units of a length of 2 m, so that the number of plants in the experimental unit becomes 10 plants, and thus the plant density becomes 3.90 m⁻² and the total number of experimental units becomes 42 units. As three seeds were placed in one pit, and after the completion of germination, they were reduced to one plant in the pit. The experiment was conducted under conditions of protected cultivation inside unheated greenhouses with dimensions of 50 * 9, with a total area of 450 square meters. The experiment included two factors and three replications, according to the completely randomized design (RCBD). It was conducted as split plot design, where the salinity of irrigation water was counted in the main plot and cultivars in the subplot. The apical meristem was cut two weeks after cultivation In order to increasing the number of lateral branches [6]The agricultural service operations were conducted in a similar fashion, including fertilization, irrigation, control, harvest and breeding, using climbing lines, In addition, lines were created transversely to climb plants along the lines to protect the plants from breaking and getting tangled. The data were analyzed statistically according to the statistical program [7], and the averages were compared using the L.S.D Least Significant Difference test at a probability level of 0.05.

The following indicators have been studied.
The percentage of nitrogen in the leaves %.
The following steps were followed to digest the plant samples (leaves), according to [8]. The total nitrogen was estimated in the plant samples using a steam distillation device (Keldal) according to the method of [9].
The percentage of phosphorous in the leaves %
It was estimated using a spectrophotometer at a wavelength of 700 nm, according to [10]
the percentage of potassium in the leaves %
Determined using a flamephotometer according to the method [9].
The percentage of sodium in the leaves (%)
The sodium in the digested leaves samples was estimated according to the [8] using a flame emitting device according to the method of [9].
The percentage between potassium/sodium concentration in the leaves.
The ratio between potassium/sodium concentration was estimated by dividing the potassium concentration in leaves by the sodium concentration in leaves.

3. Results and Discussion

3.1 The percentage of the nitrogen
Table (1) showed that the salinity of irrigation water and the cultivars did not significantly affect the nitrogen content of leaves. This is consistent with what [11] found while disagreeing with what [12] found. As for the interaction between the two factors, it showed a significant effect on the percentage of nitrogen component in the leaves, where the Wasit cultivar irrigated with tap water gave the highest percentage of nitrogen in the leaves, which amounted to 2.643%, Where, the Mosul (Karamles) cultivar irrigated with salt water gave the lowest nitrogen content, reaching 0.438%.

Table (1) Effect of salinity of irrigation water and cultivars and the interaction between them on the percentage of nitrogen per plant of Armenian cucumber

| Cultivars      | Salinity of irrigation water | The average of cultivars |
|----------------|------------------------------|-------------------------|
|                | Natural                      |                         |
| Basra          | 1.278                        | 2.573                   |
| Amarah         | 1.313                        | 1.963                   |
| Nasiriyah      | 1.435                        | 2.538                   |
| Wasit          | 1.216                        | 2.643                   |
| Baghdad        | 1.138                        | 2.153                   |
| Diwaniya       | 1.435                        | 2.293                   |
| Samawah        | 1.348                        | 2.555                   |
| Najaf          | 1.033                        | 2.450                   |
| Karbala        | 1.785                        | 1.943                   |
| Diyala         | 1.208                        | 1.383                   |
| Alramadi       | 1.435                        | 1.260                   |
| Tikrit         | 1.803                        | 1.628                   |
| Kirkuk         | 3.365                        | 1.470                   |
| Mosul (Karamles)| 0.438                       | 1.628                   |
| Babylon        | 1.908                        | 1.995                   |
| Iranian        | 2.030                        | 2.013                   |
| French         | 2.223                        | 1.506                   |
| Dutch          | 1.716                        | 1.260                   |
| Italian        | 1.540                        | 1.138                   |
| Egyptian       | 1.821                        | 0.770                   |
| Mosul (Akaf)   | 1.733                        | 0.998                   |
| The average of Salinity | 1.486 | 1.817 |

LSD 0.05

| Cultivars | Salinity | Interaction |
|-----------|----------|-------------|
| N.S       | N.S      | 1.198       |

3.2 The percentage of phosphorous
Table (2) showed that the salinity of irrigation water did not significantly affect, and it appears from the same table that the varieties differed significantly in this characteristic as the varieties outperformed Tikrit, Samawa, Diwaniyah, Wasit, Nasiriyah, Amara and Mosul (Karmles), French and Mosul (Abu Akaf) with the highest percentage of phosphorus in the leaves, which amounted to 0.2299%. And 0.1675%, 0.2155%, 0.1504%, 0.1780%, 0.1796%, 0.220%, 0.1952%, and 0.729%, respectively, while the lowest varieties in the content of its leaves of fossils are Italian, Iranian, Babylon, Kirkuk, Ramadi and Diyala. It reached 0.0201%, 0.0591%,
0.0856%, 0.0431%, 0.0863%, and 0.0730%, respectively. This is due to the genetic factors of the variety and the extent of its adaptation to environmental conditions, and this is consistent with what he found [11],[4]. As for the interaction between the two workers, it showed a significant effect on the leaf content of the phosphorus component, as plants of the French variety irrigated with natural water gave the largest amount of phosphorus, which reached 0.3308%, while plants of the variety Baghdad irrigated with natural water gave the lowest amount of phosphorus, which reached 0.0042%.

Table (2) Effect of salinity of irrigation water and cultivars and the interaction between them on the percentage of phosphorus per plant of Armenian cucumber

| Cultivars       | Salinity | Natural | The average of cultivars |
|-----------------|----------|---------|-------------------------|
| Basra           | 0.1082   | 0.1307  | 0.1195                  |
| Amarah          | 0.2682   | 0.0910  | 0.1796                  |
| Nasiriyah       | 0.1439   | 0.2121  | 0.1780                  |
| Wasit           | 0.1793   | 0.1215  | 0.1504                  |
| Baghdad         | 0.0075   | 0.0042  | 0.0058                  |
| Diwaniya        | 0.1915   | 0.2396  | 0.2155                  |
| Samawah         | 0.1458   | 0.1892  | 0.1675                  |
| Najaf           | 0.0138   | 0.2120  | 0.1129                  |
| Karbala         | 0.0118   | 0.1932  | 0.1025                  |
| Diyala          | 0.0120   | 0.1340  | 0.0730                  |
| Alaramadi       | 0.0205   | 0.1521  | 0.0863                  |
| Tikrit          | 0.2672   | 0.1926  | 0.2299                  |
| Kirkuk          | 0.0221   | 0.0640  | 0.0431                  |
| Mosul (Karamles)| 0.2609   | 0.1831  | 0.2220                  |
| Babylon         | 0.0203   | 0.1509  | 0.0856                  |
| Iranian         | 0.0251   | 0.0931  | 0.0591                  |
| French          | 0.0595   | 0.3308  | 0.1952                  |
| Dutch           | 0.0113   | 0.1979  | 0.1046                  |
| Italian         | 0.0110   | 0.0291  | 0.0201                  |
| Egyptian        | 0.0088   | 0.2501  | 0.1295                  |
| Mosul (Akaf)    | 0.0225   | 0.3234  | 0.1729                  |
| The average of Salinity cultivars | 0.0863 | 0.1664 |
| Interaction     | N.S      | 0.1194  |

3.3 The percentage of the potassium

Table (3) showed that the salinity of irrigation water caused a significant increase in the potassium content of leaves, with an increase of 33.71% compared to Natural water. The reason for this may be mainly due to the interaction between sodium and potassium ions, which causes a significant increase in the absorption of potassium ion[13]. This interaction between these two ions is due to the competitive effect between them on the sites of absorption in the roots and on the ion transporter proteins in the presence of sodium ions in high concentrations in the growth medium, the transport proteins as well as channels for transporting potassium K + Chanael transport potassium ions instead of sodium, causing an increase in its concentration in the leaves [14]. This is consistent with what [15] found. It appears from the same table that the cultivars differed significantly in
this traits as the cultivars Tikrit and Kirkuk gave the highest percentage of potassium in the leaves, which amounted to 6.820% and 6.503%, respectively. While the lowest cultivars gave a percentage of the potassium element in the leaves in Diwaniyah, Karbala, Mosul (Karamles), Babylon and Mosul (Akaf), which amounted to 4.240%, 4.760%, 4.798%, 4.810% and 4.6975, respectively. This is due to the genetics of the cultivar and its adaptation to environmental conditions, and this is consistent with [11],[4]. As for the interaction between the two factors, it showed a significant effect on the potassium content of the leaves, where the plants of the Tikrit cultivar irrigated with salt water gave the highest percentage of the potassium element in the leaves, reaching 7.290%, while the plants of the Mosul (Abu Akaf) cultivar gave irrigated with Naturalwater the lowest percentage of potassium in leaves it amounted to 2.594%.

Table (3) Effect of salinity of irrigation water and cultivars and the interaction between them on the percentage of potassium per plant of Armenian cucumber

| Cultivars    | Natural | Salinity | The average of cultivars |
|--------------|---------|----------|-------------------------|
| Basra        | 7.045   | 3.210    | 5.128                   |
| Amarah       | 6.975   | 3.305    | 5.140                   |
| Nasiriyah    | 4.990   | 6.870    | 5.930                   |
| Wasit        | 6.420   | 4.425    | 5.423                   |
| Baghdad      | 5.685   | 5.095    | 5.390                   |
| Diwamiya     | 4.395   | 4.085    | 4.240                   |
| Samawah      | 6.660   | 4.985    | 5.823                   |
| Najaf        | 6.415   | 4.775    | 5.595                   |
| Karbala      | 4.885   | 4.635    | 4.760                   |
| Diyala       | 5.650   | 4.495    | 5.073                   |
| Alaramadi    | 6.450   | 4.080    | 5.265                   |
| Tikrit       | 7.290   | 6.350    | 6.820                   |
| Kirkuk       | 7.250   | 5.755    | 6.503                   |
| Mosul        | 5.930   | 3.665    | 4.798                   |
| (Karamles)   |         |          |                         |
| Babylon      | 5.055   | 4.565    | 4.810                   |
| Iranian      | 6.805   | 4.810    | 5.808                   |
| French       | 6.595   | 4.425    | 5.510                   |
| Dutch        | 6.455   | 4.360    | 5.408                   |
| Italian      | 6.560   | 5.090    | 5.825                   |
| Egyptian     | 5.790   | 5.720    | 5.755                   |
| Mosul (Akaf) | 6.800   | 2.594    | 4.697                   |
| The average of salinity | 6.195 | 4.633 |                       |
| Cultivars    |         |          |                         |
| LSD 0.05     | 0.838   | 0.522    | 1.181                   |

3.4 The percentage of sodium

Table (4) showed that the salinity of irrigation water has caused a significant increase in the sodium content of leaves, with an increase of 325.43% compared to Naturalwater. The reason for this may be due to the increased absorption of the sodium component due to its increased concentration in the growth medium [16]- also, the presence of sodium chloride in high concentrations in the growth medium caused an increase in the absorption of sodium ions and thus the withdrawal of these large amounts of toxic ions into the vacuoles of plant cells through the Na+/H + Antiport pump through the tonoplast membrane. Thus drawing water to sustain plant life [17] and thus the sodium ion quickly enters into the cell due to the negative voltage of the cell membranes inside, and then the sodium ion may accumulate inside the vacuoles more than it accumulates in the cell walls [18]. These results agree with [12]. It appears from the same table that the cultivars differed significantly in this trait where the Diyala cultivar excelled compared to the rest of the cultivars by giving the highest percentage of the sodium element in the leaves amounted to 5.548%, While the cultivar Amara gave the lowest percentage of sodium in the leaves, which amounted to 2.218%. This may be due to the genetics of the cultivar and the extent of its...
adaptation to environmental conditions. As for the interaction between the two factors, it showed a significant effect on the sodium content of the leaves. Diyala plants irrigated with salt water gave the highest percentage of sodium in the leaves, reaching 10.105%. While the cultivar Basra, Amara, Baghdad, Diwaniyah and Karbala irrigated with Natural water gave the lowest sodium content in leaves, which were 0.490%, 0.490%, 0.490%, 0.490% and 0.490%, respectively.

Table (4) Effect of salinity of irrigation water and cultivars and the interaction between them on the percentage of sodium per plant of Armenian cucumber

| Cultivars            | Salinity of irrigation water | The average of cultivars |
|----------------------|------------------------------|---------------------------|
|                      | Natural                      |                           |
| Basra                | 5.915                        | 0.490                     | 3.203 |
| Amarah               | 3.945                        | 0.490                     | 2.218 |
| Nasiriyah            | 5.175                        | 3.940                     | 4.558 |
| Wasit                | 6.655                        | 1.975                     | 4.315 |
| Baghdad              | 5.915                        | 0.490                     | 3.203 |
| Diwaniya             | 6.410                        | 0.490                     | 3.450 |
| Samawah              | 4.435                        | 1.480                     | 2.958 |
| Najaf                | 6.900                        | 2.710                     | 4.805 |
| Karbala              | 5.420                        | 0.490                     | 2.955 |
| Diyala               | 10.105                       | 0.990                     | 5.548 |
| Alramadi             | 7.150                        | 0.990                     | 4.070 |
| Tikrit               | 5.670                        | 1.975                     | 3.823 |
| Kirkuk               | 7.150                        | 1.480                     | 4.315 |
| Mosul (Karamles)     | 5.175                        | 1.970                     | 3.573 |
| Babylon              | 6.410                        | 2.220                     | 4.315 |
| Iranian              | 6.660                        | 0.740                     | 3.700 |
| French               | 6.410                        | 1.970                     | 4.190 |
| Dutch                | 7.395                        | 1.480                     | 4.438 |
| Italian              | 6.410                        | 1.970                     | 4.190 |
| Egyptian             | 7.640                        | 0.990                     | 4.315 |
| Mosul (Akaf)         | 6.165                        | 1.970                     | 4.068 |
| The average of       | 6.339                        | 1.490                     |      |
| Salinity             | 6.339                        | 1.490                     |      |
3.5 The percentage of potassium to sodium

It is evident from Table (5) that irrigation with Natural water caused a significant increase in the percentage of potassium to sodium, with an increase of 330.83% compared to salt water. The reason may be due to the presence of high amounts of sodium that may affect the permeability of the plasma membrane. The significant decrease in the ratio between potassium to sodium K⁺/Na⁺ when irrigating with saline water may be due to the increase in the concentration of sodium ion in the growth medium, since this percentage is one of the important indicators of plant tolerance to salinity [19]. This result agrees with [12]. It appears from the same table that the cultivar differed significantly in this traits, where the two cultivars, Baghdad and Karbala excelled compared to the rest of the cultivars by giving the highest percentage of potassium to sodium in the leaves of 5.681% and 5.180%, respectively. While the cultivars Mosul (Abu Akaf), Italian, French, Babylon, Mosul (Karamles), Najaf, Wasit and Nasiriyyah gave the lowest percentage of potassium to sodium in the leaves, which were 1.209%, 1.804%, 1.638%, 1.437%, 1.507%, 1.392%, 1.654% And 1.352%, respectively. It may be due to the genetics of the cultivar and its adaptation to environmental conditions. As for the interaction between the two factors, it showed a significant effect on the leaves' content from the percentage of potassium to sodium, As the plants of the cultivar, Baghdad irrigated with Natural water gave the highest percentage of potassium to sodium in the leaves, reaching 10.398%, while the Diyala cultivar irrigated with saline water gave the lowest percentage of potassium to sodium in the leaves, which was 0.563%.

Table (5) Effect of salinity of irrigation water and cultivars and the interaction between them on the percentage of potassium to sodium per plant of Armenian cucumber

| Cultivars          | Salinity of irrigation water | The average of cultivars |
|--------------------|-----------------------------|--------------------------|
|                    | Natural                     |                          |
| Basra              | 1.210                       | 6.551                    | 3.880                  |
| Amarah             | 1.784                       | 6.745                    | 4.264                  |
| Nasiriyyah         | 0.960                       | 1.744                    | 1.352                  |
| Wasit              | 0.984                       | 2.325                    | 1.654                  |
| Baghdad            | 0.964                       | 10.398                   | 5.681                  |
| Diwaniya           | 0.695                       | 8.337                    | 4.516                  |
| Samawah            | 1.526                       | 3.615                    | 2.570                  |
| Najaf              | 0.929                       | 1.854                    | 1.392                  |
| Karbala            | 0.901                       | 9.459                    | 5.180                  |
| Diyala             | 0.563                       | 4.540                    | 2.552                  |
| Alramadi           | 0.902                       | 4.121                    | 2.512                  |
| Tikrit             | 1.309                       | 3.409                    | 2.359                  |
| Kirkuk             | 1.022                       | 3.889                    | 2.455                  |
| Mosul (Karamles)   | 1.153                       | 1.860                    | 1.507                  |
| Babylon            | 0.808                       | 2.066                    | 1.437                  |
| Iranian            | 1.031                       | 6.962                    | 3.996                  |
| French             | 1.029                       | 2.246                    | 1.638                  |
| Dutch              | 0.879                       | 2.946                    | 1.912                  |
| Italian            | 1.023                       | 2.584                    | 1.804                  |
| Egyptian           | 0.758                       | 5.778                    | 3.268                  |
| Mosul (Akaf)       | 1.102                       | 1.317                    | 1.209                  |
| The average of Salinity | 1.025                                      | 4.416                    |
| cultivars          |                             | Salinity Interaction     |
| LSD 0.05           | 0.632                       | 0.528                    | 0.907                  |
4. Conclusions
Irrigation with a concentration of 5 dSm⁻¹ caused a significant increase in the content of leaves of potassium and sodium, with an increase of 33.71% and 325.43% respectively. The cultivar Tikrit had the highest content of phosphorous and potassium, while the Diyala cultivar gave the highest content of sodium and the Baghdad Cultivar by giving the highest content in its leaves from the percentage of potassium to sodium, which is an indication of its increased salt tolerance.

References
[1] Matlub, A N E S M, and Karim, S A 1989, Vegetable Production, Part Two, Mosul University Press, Iraq. https://reliefweb.int/sites/reliefweb.int/files/resources/UN-Habitat_MosulCityProfile_V5.pdf.
[2] Al-Sahuki, M, and Al-Khafaji, M J 2014, The mechanism of plant tolerance to high salinity. Iraqi Journal of Agricultural Sciences, 45(5), 430-438.https://www.iasj.net/iasj/download/f845eae944157e98
[3] Bhattacharjee, S 2008, Triadimefon pretreatment protects newly assembled membrane system and causes up-regulation of stress proteins in salinity stressed Amaranthus lividus L. during early germination. J. Environ. Biol, 29(5), 805-810.
[4] Al-Zubaidi, N W Q 2010, The effect of the date of cultivation seeds, seedlings and spraying with agarone on the growth and productivity of two cultivars of watermelon, Master Thesis. College of Agriculture - University of Mosul, Iraq.
[5] Şensoy, S, Türkmen, O, Kabay, T, Erdinç, Ç, Turan, M, and YILDIZ, M 2005, Determination of salinity tolerance levels of melon genotypes collected from Lake Van Basin. Journal of Biological Sciences, 5(5), 637-642.
[6] Oga, I O, and Umekwe, P N 2016, Effects of pruning and plant spacing on the growth and yield of watermelon (Citrus lanatus L.) in Unwana-Afikpo. International Journal of Science and Research, 5(4), 110-115.
[7] GenStat 2011, GenStat Release 10.3DE (PC/Windows 7) 11 July 2012 16:50:12 Copyright 2011, VSN International Ltd. (Rothamsted Experimental Station.)
[8] Cresser, M S, and Parsons, J W 1979, Sulphuric—Perchloric acid digestion of plant material for the determination of nitrogen, phosphorus, potassium, calcium and magnesium. Analytica Chimica Acta, 109(2), 431-436.
[9] Page, A L, Miller, R H, and Keeney, D R 1982, Methods of soil analysis, part2, 2nd Ed. Madison, Wisconsin, USA, PP.1159.
[10] Murphy, J A M E, and Riley, J P 1962, A modified single solution method for the determination of phosphate in natural waters. Analytica chimica acta, 27, 31-36.
[11] Adams, P, and Ho, L C 1989, Effects of constant and fluctuating salinity on the yield, quality and calcium states of Tomatoes. J. Hort. Sci., 64, 725-732.
[12] Chartzoulakis, K 2005, Salinity and olive, Growth, salt tolerance, photosynthesis and yield. Agr. Water manag, 78, 108-121.
[13] Hernández, E J, Melendez-Pastor, I, Navarro-Pedreno, J, and Gómez, I 2014, Spectral indices for the detection of salinity effects in melon plants. Scientia Agricola, 71(4), 324-330.
[14] Chen, Q, Lin, Y 2000, Effect of H2O2 OH and their scavengers on the H+ transport activity of the tonoplast vesicles in barley leaves. Acta Plant Physiol. Sic. 2, 281-286.
[15] Ashraf, M 1994, Breeding for salinity tolerance in plants. Crit. Rev. Plant Sci., 13, 17-42.