Effect of Pollution with Some Heavy Elements and Petroleum Hydrocarbons on Some Fruits and Leaves Characteristics of *Phoenix dactylifera* L. CV.Hillawi

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Summary

This study was conducted in five private orchards situated at Al- Dair District (Naher Bin Omar , Al-Zuein , Al-Ghrahi and Om-Masjid) and at Abo El-Khassib District (Al-Saragi , as Control site) during the period 25 / 2 / 2018 - 30 / 9/2018 to investigate the effect of pollution with heavy elements and petroleum hydrocarbons on some characteristics of the date palm fruits and leaves of the Hillawi cultivar .Soil samples , deposition atmospheric dust and date palm samples were collected from the sites that were selected during the study period and some physical and chemical properties of the soil were estimated .The concentrations of lead, cadmium, iron and zinc elements in the soil were estimated and their concentration in the deposition atmospheric dust and in the leaves and fruits of Hillawi date palm trees by using an Atomic Absorption Spectrometer .The biochemical, anatomical, and molecular characteristics of the leaves, as well as some physical and yield characteristics of Hillawi date palm trees were also determined.

Results of this study showed the following :

1- It was found that the highest concentrations of the studied elements (lead, cadmium and zinc) were in the soil of the site, Naher Bin Omar and it reached to 73.504 , 6,231, 284.029 mg kg^{-1} respectively, whereas it was found that the highest concentration of iron was in the soil of the site Om- Masjid, and it reached 5456.891 mg kg^{-1}, The lowest concentrations of lead, cadmium and zinc were recorded in the soil of Al-Saragi site and they were 26.326 , 1.263 , 44.651 mg kg^{-1} respectively, as for iron only , the soil

of the site of Al-Saragi recorded the lowest concentration of 4139.237 mg kg^{-1}.

2- It was observed that the highest concentrations of the studied elements, lead, cadmium, iron and zinc in the deposition atmospheric dust were at the Al-Zuein site and were 19.23, 0.256, 1247.77, 192.17 mg m^{-3} respectively, whereas Al-Saragi site recorded the lowest concentrations of the elements and it was 2.88 , 0.051 , 287.448, 30.17 mg m^{-3} respectively.

3- It was found that the highest concentrations of the studied elements lead, cadmium and zinc were in the leaves and fruits of Hillawi cultivar for the Naher Bin Omar site, whereas it was found that the highest concentration of iron was in the leaves and fruits of Al-Zuein trees and that the lowest concentration of lead, cadmium, iron and zinc was recorded in the leaves and fruits of Hillawi trees at Al-Saragi site.

Results of heavy elements effect on the studied characters showed the followings:

1- Al-Saragi site recored significant increase in total chlorophyll pigment in leaves over the rest of the sites with the exception of Om-Masjid site, and it was 4.87 and 4.25 mg100 g^{-1}, respectively, whereas the site of Naher Bin Omar gave the lowest value of 2.69 mg 100 g^{-1}.

2- Al-Saragi site was significantly superior over the rest of the sites and recorded the lowest concentration of hydrocarbons in the leaves and fruits of trees. whereas, Al-Zuein recorded the highest concentration of hydrocarbons in date palm leaves and fruits trees.

3- The site of Naher Bin Omar recorded significant increase in leaf total soluble carbohydrate over the other sites , but did not differ significantly from the site of Al-Zuein (24.17 and 22.98 mg g^{-1} dry weight respectively). whereas Al-Saragi site gave the lowest value of 18.06 mg g^{-1}dry weight.

4- The site of Naher Bin Omar record significant increase in leaf content of amino acid proline over the other sites , but did not differ significantly from the site of Al-Zuein and gave 13.01 and 11.78 µmol gm^{-1} fresh weight respectively, Al-Saragi site gave the lowest content of 7.00 µmol gm^{-1} fresh weight.

5- The site of Naher Bin Omar gave significant increase in the average fruit weight, length and diameter over the other sites and gave values of 8.65 gm, 3.543 cm, and 1.394 cm respectively, while the Al-Zuein site recorded the lowest values which were 5.37 gm, 2.764 cm, and 1.190 cm, respectively.

6- Al- Saragi site had significant increase in productivity over the other sites and gave the highest productivity of palm trees, which reached 42.82 kg, whereas the site of Naher Bin Omar recorded the lowest productivity of 14.17 kg.

7- The study of the anatomical characters of palm tree leaves, showed that Naher Bin Omar site had lower length and width of vascular bundles, lower as well as thickness of proto and meta xylem and phloem ,increase in thickness of the upper epidermis and the cuticle of upper epidermis, increase in thickness of lower epidermis and cuticle of lower epidermis, but there was a reduction in mesophyll layer thickness and reduction in cell size. Result showed heavy spreading of tannin cells in all sites as compared with Al-Saragi site.

8- The Naher Bin Omar site had a lower value of Genetic Similarity Index (GSI) to ISSR primers (72%) as compared with that the Al- Saragi site, as well as reducing the value of the Genome Template Stability index (GTS) at the Naher Bin Omar site with a percentage of (65.5%).The results of the Dendrogram analysis of the clusters of the amplified DNA bundles resulting from the primers in the palm tree leaves showed that the sites were divided into two main groups . The first main group included the Naher Bin Omar site and the second main group was divided into two subgroups. The first subgroup included the Al-Zuein site. The second sub-cluster contained the first cluster that the Al-Ghrahi site, which was associated with a binary

group consisting of the two sites Om-Masjid and Al- Al-Saragi, which indicates that sites close to the sources of pollution lead to the occurrence of genetic changes confirmed by the study of ISSR indicators.